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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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On the Need of a Policy

IF an outsider who had never heard before of the Society of Chemical Industry had attended the Glasgow meetings, he would have been impressed by the good feeling which obviously prevailed among the members and by the general strength of the Society's position; but he would have found it difficult to infer from the speeches and discussions what the specific policy of the Society is and the bearing of the Glasgow meetings on its promotion. We can recall only three points suggestive of any definite action, and they were in the nature of "asides." Mr. Young, the chairman of the Glasgow section, urged the advantage of increasing the number of joint meetings with kindred societies and of meetings between two or more sections favourably situated for the purpose. Not a startlingly new suggestion, it is true, but none the less sound or practically useful on that account. Dr. Armstrong, the new President, in acknowledging the courtesy of the Institution of Shipbuilders and Engineers in placing their hall at the service of the Annual Meeting, pleaded for the establishment of a similar central hall for the Society. Another excellent suggestion, about which a good deal has been heard of late, but towards the attainment of which no definite move has yet been made. Dr. Ruttan added a note on the need of some sort of chemical compendia which would make people less dependent than they have hitherto been on the German provision for this need.

With these exceptions the discussions disclosed no approach to any special policy or programme for the coming year or for those following. This seems to many a weakness in the organisation. The proceedings year after year follow the same respectable order, with no sign of any marked development. Meetings of sections are periodically held throughout the country, papers on various problems arising in connection with chemistry are read, a proportion of which appear in the *Transactions*, and if when the Annual Meeting comes round again the Secretary can record a satisfactory membership and the Treasurer can show a decent balance in hand all is considered well. Within these limits much very useful work is done, but the tendency is towards routine and repetition, and here and there a demand is heard for a more spirited initiative and a wider ambition. To the list of points already mentioned two may be added. There is first the proposal for the establishment of a science advisory committee to be appointed and recognised by the Government for consultative purposes. The Society of Chemical Industry is the largest of the chemical organisations, and if at Glasgow it had definitely pronounced in favour of such a scheme, its judgment must have favourably influenced that of other associations. But so far as we recollect no word was uttered on the subject publicly.

It is possible, again, that the sectional programmes might be directed more effectually to some common purpose. At present the Sections select their own readers of papers on no very definite plan, and while many of the contributions are excellent individually they do not converge on any particular point. It is difficult to resist a conviction that a great deal of mental effort is dissipated over too wide and promiscuous a field, and that its concentration on more definite lines of study on some central plan would produce more fruitful results. Why, for example, should not some special problem be set for each year, and arrangements made well in advance with half a dozen or fewer leading authorities to open discussions on it under different aspects at various centres in succession? In this way one might feel that each year carried certain matters a stage forward. Other suggestions might be developed, but enough has been said to show the possibilities of an annual programme.

One yet broader aspect might have struck the outsider at Glasgow. Does the country as a whole know anything more about chemical science and chemical

industry than it did before as the result of the Glasgow meetings? Will a single one of the firms who ought to be employing chemists but do not be induced to establish a chemical department? Will any single industry be induced to give a larger place to chemistry in its organisation and outlook? We very much fear that the answer in each case must be in the negative. Yet the Society exists to promote chemical "industry," and the larger employment of chemistry in all industry. In saying this we are far from belittling the excellent work done in improving chemical knowledge and process among the members. As iron sharpens iron, the minds that are brought together are all quickened. But all this is interior education. What we miss is some effort at exterior education—the conversion of industries and firms which make no use or a much too restricted use of chemistry to a recognition of its vital importance to their own stability and progress. Dr. Armstrong was the first chemist to be engaged by Huntley and Palmer. It was a new step for the firm to take, and we imagine they have no cause to regret it. How many firms are there still in this country who ought to be similarly equipped with an expert chemical service? And what steps are being taken to convince them that, in not so equipping themselves, they are neglecting one of the greatest aids to their own progress? Practically none, we fear. Here, surely, the Society has a duty and a mission beyond the immediate service of its own internal interests. And here, in spite of Professor Armstrong's warning, the arts of the journalist and the propagandist are badly needed.

A Good Example

THERE must, no doubt, be a number of the younger members of the chemical engineering profession who feel that their particular experience justifies their submitting papers for discussion before the technical societies, but who hesitate to do so because they have neither sufficient knowledge of the correct manner of presenting their facts nor sufficient confidence to expose themselves to criticism. To be conscious of one's own limitations is a commendable quality, and were some of us more alive to our own imperfections it is possible that a much higher standard would rule so far as paper-reading is concerned. There is no question, however, that at the present time it is particularly difficult for the officers of technical societies to persuade their members to contribute to the proceedings, for one's business life is still so abnormally strenuous that the compilation of a paper usually entails some considerable sacrifice of leisure. It is the men of some repute who are usually marked down as the quarry of the paper hunters; but, unfortunately, it is just such men who usually have not the time to spare, and who cannot, from the point of view of their reputation, afford to undertake such work unless time permits them to give of their best.

After all, paper writing is an altruistic occupation, for one's labour has seldom the permanent value of the text-book. As to this question of permanency of value there are, however, exceptions, and we have little hesitation in saying that one such exception is Mr. Parrish's contribution last week to the conference of the Chemical Engineering Group. His paper on the design and working of ammoniacal liquor stills is singled out in particular, for the reason that it shows obvious signs of having demanded considerable thought and no little patience. The clarity of the argument is sustained throughout by innumerable diagrams, and it is likely that the paper will form a standard treatise on the subject until it is superseded by the author's promised book on "By-Product Ammonia" which is to form one of Benn Brothers' "Gas and Fuel" series of text-books. Mr. Parrish's paper may be commended to the attention of those younger members of the chemical industry who, as mentioned above, are as yet to bud forth as paper writers. Here, in method of treatment, they have an example which, if conscientiously followed, should allay any fears which they may have as to criticism.

The paper itself does not permit very much in the way of stray comments so far as the technical information it contains is concerned. It is a consecutive narrative which must be taken as a whole; but there are one or two "asides" which are worthy of emphasis. For instance, many will remember the interest aroused nearly twenty years ago by the vacuum sulphate of ammonia plant and the merits as regards economy of operation which were claimed for it, particularly where exhaust steam was available. The system was fairly extensively adopted in Scotland, but it never made much progress farther south. Mr. Parrish has ably dealt with the claims made for it, and tells us that no great saving in steam consumption is likely to accrue from its use, while the velocity of the steam through the still is appreciably increased. Hence time contact is reduced correspondingly for a given weight of steam.

Throughout the paper there is evidence of the suggestion that, if progress is to be made, designers must concentrate their energy and attention on the evolution of the elements of a still which will be economical as regards steam consumption. Data must be arrived at as to the relative value of attenuated bubbling as compared with time contact of the liquid and the vapours as a factor in aiding equilibrium. Heating surface is not alone the governing factor which should be aimed at in the design of ammoniacal liquor stills; but rather must attention be directed toward ensuring the greatest intimacy of contact along with maximum time contact and heating surface. In the matter of ammonia recovery there is, however, such a thing as striving after efficiency which may prove false economy. For instance, experience has shown that 0·015 per cent. of ammonia in the waste liquor is an economic strength. Working below this limit merely resolves itself into the recovery of an exiguous amount of ammonia at the expense of labour in operating the plant.

The Alkali Works Report

THE Report for 1921 which has just been issued by Dr. T. Lewis Bailey, the Chief Inspector under the Alkali Acts, will on first acquaintance create some surprise in that the amount of information which it contains has been so curtailed that the volume is only just half its normal bulk. This, we have no hesitation in saying, is disappointing, for industrial chemists and works managers in general have come to regard the

report not merely as a memorandum of interesting and valuable statistics, but as a wise counsellor so far as the elucidation of many of their practical worries are concerned. It is difficult to account for this sudden and quite unexpected attenuation; for, although the industries concerned have passed through, and are now emerging from, a most trying period, the difficulties of operating plants at a much reduced capacity as compared with their operation at full output should have provided an unusual opportunity for enlarging upon the manner of meeting such contingencies. The Report does not itself shed much light on the reasons which have led to its emaciation, though a cryptic reference to "a period when the work of administration has had to be carried on by a reduced staff" may imply that the Geddes axe has possibly aimed a blow in what all chemists will consider the wrong direction.

So far as the statistical information is concerned, it is to be noticed that while the total number of registered works showed, as compared with the preceding year, a falling-off of 41, the number of separate processes dropped away by 91. In this portion of the Report we must draw attention to the omission of the customary tables of comparison, while in particular it is more than difficult to understand the absence of the usual data concerning the separate processes of manufacture under inspection—probably one of the most valuable features of nearly all previous Reports. For instance, to take a single example, those who have wished to ascertain the number of sulphuric acid plants at work in this country, and who were anxious to make a comparison between consecutive years, had only to refer to this table. Now, however, that it is omitted there is no means of ascertaining what the position was in the past year. Those associated with the industry already have full knowledge of what the Report does vouchsafe to tell them, namely, that "there has been a comparatively small demand for sulphuric acid, and consequently operations have been on a considerably reduced scale."

In view of the attention which has recently been given in THE CHEMICAL AGE to the question of substituting the ammonia converter for the nitre pot, it is encouraging to hear from Dr. Bailey that this method of providing oxides of nitrogen continues to establish itself. Not only are firms who have already adopted it extending its use, but the method is being taken up by others in various parts of the country. If a gas mixture containing 10 per cent. of ammonia is used and a satisfactory gauze temperature maintained, excellent results are given. Attention, too, is called to the advantages gained by pre-heating the ammonia-air mixture by some form of heat interchanger. It is satisfactory to note that research connected with the solution of certain practical difficulties has been continued, and the Report contains a helpful summary (which to some extent compensates for its other deficiencies) dealing with the treatment of effluent liquors.

A.B.C.M. Progress

THE Association of British Chemical Manufacturers, whose sixth annual meeting was held on Thursday, may be congratulated on the renewal for another five years of its agreement with the general manager, Mr. W. J. U. Woolcock, M.P. The secret of the remarkable success and the commanding position the Association has attained in the comparatively short space of five years lies in the large number of firms who have been induced to join in collective action. Here Mr. Woolcock has played the part of a real organiser in discovering lines of common action, and in maintaining a real and effective unity among so many individual interests. The Association has established a new centre of gravity for British chemical industry; wherever it was supposed to be before, it is now definitely fixed in Piccadilly.

During the past year work in progress has been extended and new work undertaken. Among the latter is the movement for the establishment of an Institution of Chemical Engineers, which the Council view with sympathetic interest and expect to become of considerable benefit to chemical and plant manufacturers. Another important step is the appointment of a committee, consisting of Mr. Max Muspratt, Mr. E. V. Evans, Mr. N. N. Holden, Mr. R. G. Perry, Dr. Ree, and Mr. A. T. Smith, to inquire into the cost of dyestuffs production in this country, and to suggest, if possible, means of reducing it. The important problem of transport has engaged the attention of the Council throughout the year, and it is stated that no other industry has received more concessions from the Rates Advisory Committee than the chemical industry. These are but a few typical instances, selected out of many, of the excellent work the Association is doing. If the progress made in the second five years equals that during the first five, the Association will have a record on which it would be very difficult to improve.

Points from our News Pages

Concluding reports, with notes are published of the Annual Meeting of the Society of Chemical Industry and the conferences of the Chemical Engineering Group (p.p. 41-52).

An inquiry was opened on July 7 into a complaint by Messrs. R. W. Greeff and Co., that sodium hyposulphite R, and sodium thiosulphate R have been wrongly included in the Board of Trade's list under Part I. of the Safeguarding of Industries Act (p. 53).

Our London Market Report records a week of steady trade, with home business satisfactory and an active turnover in many lines (p. 59).

According to our Scottish Market Report, business during the past week has been fairly satisfactory, prices on the whole being well maintained (p. 61).

Books Received

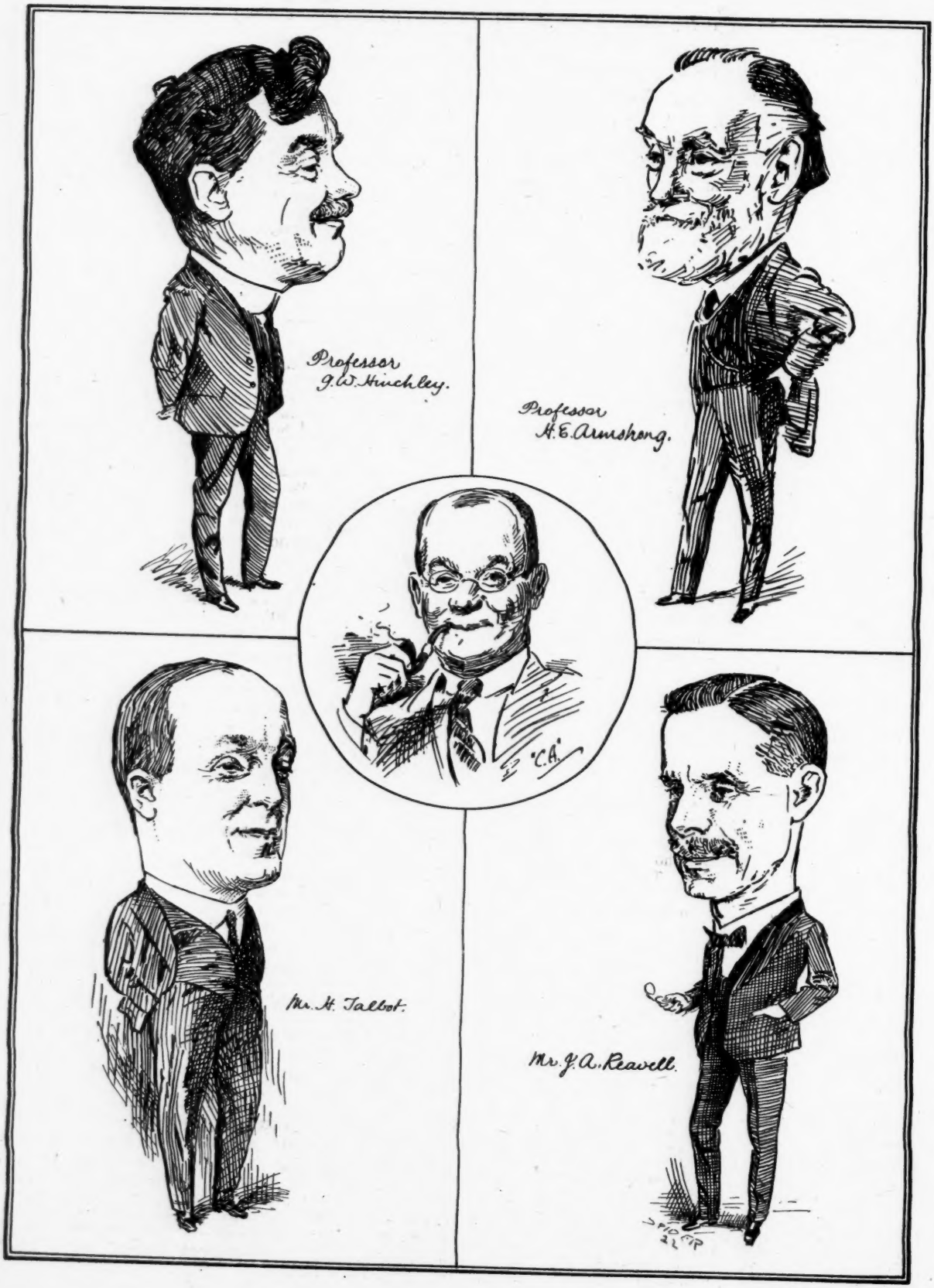
BARIUM AND STRONTIUM IN CANADA. By HUGH S. SPENCE. Canada: Department of Mines. Pp. 100.

AN INORGANIC CHEMISTRY. By H. G. DENHAM. London: Edward Arnold and Co. Pp. 683. 12s. 6d.

REPORT ON WATER POWER. Dublin: Commission of Inquiry into the Resources and Industries of Ireland. Pp. 50. 2s. 6d.

The Calendar

July 19	Rotary Club Luncheon "The Trade Conquest of Europe" Sir Ernest J. P. Benn. 1 p.m.	Hotel Cecil. London.
26	Research Association of British Rubber & Tyre Manufacturers Opening of Research Laboratories by the Right Hon. Lord Colwyn. 3 p.m.	105-7, Lansdowne Road, Croydon, Surrey.


Professor J.W. Hinchley.
Professor H.E. Armstrong.
C.A.
Mr. H. Talbot.
Mr. J.A. Reavell.

The Society of Chemical Industry

Final Reports of the Annual Meeting

We give below the concluding portions of the report of the Annual Meeting of the Society of Chemical Industry, which began in Glasgow on Tuesday, July 4, and of the two Conferences organised by the Chemical Engineering Group.

After-thoughts on the Meetings

[From Our Special Correspondent]

Among all the impressions left by the Annual Meeting upon the members who attended it, the first to be recorded and the last to be forgotten is one of Scottish hospitality at its best. The Corporation of Glasgow and some of the principal private companies recognised the public importance of the visit, and ordered their welcome with equal regard to what was due both to the Society and to their own position. The Lord Provost, in particular, may be singled out for the public courtesy he extended to the Society. At the opening meeting on the Tuesday he delivered an admirable little address, which revealed a degree of thought and attention to the place of chemistry in industry and public life which some of the Society's own speakers at the social functions might with advantage have copied. The Civic Reception and Dance in the Municipal Buildings will be remembered as one of the pleasantest features of the programme, and as setting a standard which all our other hosts accepted for themselves. The smoothness with which all the arrangements went through would have been impossible but for the thorough preparations which had been made beforehand by the Committee of the Glasgow Section. The Committee struck just the right line in everything. They provided all that the members could have wished, with always a good margin to spare, and yet succeeded in avoiding all fussiness. The organisation will long be remembered as a model for future meetings.

As already pointed out, a large portion of the week's programme was devoted to social gatherings, visits to works, and excursions to places of interest. The time so spent, however, was not lost; on the contrary it is probable that the opportunities afforded for exchanges of opinions and experience among those who rarely have an opportunity of meeting together at leisure brought as much profit as pleasure to those who enjoyed them. It was remarked again and again that the meetings brought together into personal intercourse numbers who were previously only known to each other by name. The acquaintances thus formed have a commercial as well as a social interest and well repay the time occupied in making them.

In this connection our Overseas visitors were among those who benefited most freely. There were representatives present from the United States, from Canada and other colonies, from Spain and India. The opportunity of making a first acquaintance with British chemists or of renewing old association with them was appreciated to the full, and our Overseas visitors will certainly carry away the pleasantest memories of their stay in Glasgow.

There was much informal discussion about the place of meeting for next year, but at present it appears to be uncertain which town will be selected. Leeds has been under discussion. As regards industrial conditions, it would be an admirable centre, but the local committee, it is understood, required a little longer notice to make adequate arrangements. Nottingham and Liverpool were also mentioned as possible places, and there is a further suggestion that as the International Union meets at Cambridge next year the Annual Meeting might be appropriately associated with it. But so far as one could gather, no decision has yet been come to, and the official decision must be awaited with patience. The excellence of the Glasgow arrangements would naturally deter other branches from accepting the responsibility without adequate notice for fear of lowering the standard, and it may be that as a last resort the Society will have to fall back once more on London, where emergencies can usually be fairly well met.

With the exception of the two papers read immediately after the Messel Lecture by Mr. Joyner and Dr. David, the technical discussions were confined to the two sessions of the Chemical Engineering Group. At the first, presided over by Mr. W. H. Coleman, papers were submitted by Mr. P. Parrish on "The Design of Ammoniacal Liquor Stills" and by Mr. W. A. Walmsley on "Tar Distillation." At the second, presided over by Mr. J. Arthur Reavell, Professor Hinchley dealt with "The General Problem of Evaporation" (respecting which the Chairman professed the most innocent unfamiliarity) and Mr. T. H. Gray with "Glycerin Distillation." The papers were all good, and in each case they were followed by suggestive constructive criticism, by comparisons of experience respecting works difficulties, and by a free exchange of ideas.

All the members of the Group professed themselves thoroughly satisfied with the discussions and with the attendance, and the general feeling was that the Group has now more than justified its establishment. The future relations between the Group and the proposed Institution are already being thought over; with complete confidence, however, that whether they are merged in one organisation or run on parallel lines, the problem will ultimately solve itself. At present the balance of opinion is decidedly in favour of the continuance of the Group's activities on the present lines, and even when the Institution is in being the Group, it is thought, will still have a useful field in the organisation of discussions and work of a more general character than the Institution could undertake.

In discussing the features of the Glasgow conferences with members, two points were mentioned which are worth recalling. The first was the growing disposition to exchange experiences between representatives of different firms and a corresponding departure from the old policy of secrecy. The latter never was such a safeguard of exclusive knowledge as it was supposed to be, for few concerns have information or processes of any real value which they can keep from the knowledge of others. If, however, they did manage to retain their own secrets it was at the cost of missing the secrets of others. As Dr. Ruttan put it, the closed door shuts out more than it shuts in. Assuming that the policy is reversed in favour of a free exchange of ideas, the relative positions of the members of the "pool" remain unchanged; the only real difference is that they are all relatively better informed instead of being all relatively ignorant of one another's doings, and the scope for individual initiative and efficiency—the factors which account for success—remains as wide as before. Opinion is certainly moving in this direction, and the members of the Group are finding the information given in papers and the mutual criticism directed upon it to be of real practical value.

The second point has a more personal interest. The reader of one of the papers remarked to us that the reading and research that the preparation of his paper had involved had been a real education to himself. The discussion upon it had opened up much wider aspects of the subject, and given him a more thorough insight into it. The result was a resolution to begin a much more comprehensive investigation with a view to a fuller treatment of the problem at some later date. This is the most convincing testimony to the value of such conferences. Each paper thus becomes a new starting-point, and sets men at work afresh on old or new problems. Nothing but good can result from such a quickening of intellectual interest in chemical and technological problems.

Outside the official fixtures there were some very pleasant private or semi-private gatherings at the various hotels, and such rooms as "151" and "227" became familiar meeting places, where many matters of interest were discussed with a freedom not possible in public. In addition, the excursions and visits to works were as enjoyable as they were profitable. The garden party at the Knowe, Pollockshields, on the opening day was not favoured with the best of weather, but the hearty hospitality of Mr. David Perry more than made up for this unkindness. On the second day a large party visited the Provan Chemical Works, while another went over the Kilmarnock Power Station. The former works, which are now being extended, were extremely interesting as a sample of the most modern lay-out of plant, and the neatness and unity of the plan was duly noted. The guests here were received on behalf of the Corporation by Bailie Smith, who stated that the results attained so far had considerably exceeded expectations. The work of Mr. Walmsley, the manager, came in for much favourable comment.

Briefly it may be stated that the Provan Chemical Works are the largest of the four chemical works owned by the Corporation. Messrs. Woodall, Duckham and Co. have recently erected for the Corporation the largest installation of continuous vertical retorts in the world, capable of carbonising 1,356 tons of coal per day. The crude distillation of the tar is carried out at the other three works, and all oils to be refined are transferred by railway tank-wagon up to the Provan Works. The Provan Works have been completely reorganised during the last two years, and extensive plant additions and alterations have been made, and are now nearing completion. New railway sidings have been laid to facilitate handling of goods, and the plant has been laid out with the object of securing ease of working, rapid handling of materials, and the cutting down of labour charges. The power plant consists of Babcock and Wilcox water-tube boilers with underfeed stokers for burning coke breeze under forced draught. The boilers have an evaporative capacity of 10,000 lbs. per hour. The whole of the steam is superheated. The ashes are dropped out into a pit below the boilers and are raised from there by an ash hoist to an elevated hopper over the railway for loading into trucks. The sulphate of ammonia plant consists of two units each capable of treating 70,000 gallons of ammonia liquor (1·5 per cent. NH_3) per day, equal to a production of 20 tons of sulphate of ammonia per unit per day. All pumps are concentrated in one house, and they are all of the three-throw type and are belt driven. The whole of these pumps, two sets of lime mixers, the sulphate of ammonia scraper conveyors, the hot air fan, and the sulphate of ammonia dryer, are driven by one engine from overhead line shafts. The saturators are of the open type, let into the saturator floor, which is completely covered with lead and burned to the side of the saturators, so that the whole of this floor can be swilled down with a hose pipe. The sulphate of ammonia house has all-glass roofs and the floor is of acid-resisting brick grouted in with pitch. This plant was erected by Messrs. Ernest Scott and Co., Ltd. The tar plant includes a block of four stills, each with separate pre-heater and the usual condensing coils, and is capable of distilling 200 tons of tar per day. The cauticising and carbolic extraction plant has been designed to make from 10-20,000 gallons of crude tar acids per week. It comprises a Dorr continuous causticising plant, capable of producing 10 tons of caustic soda per day. Lime and soda ash coming in by wagon will be elevated by an electric hoist into a raised store. A Harding conical ball mill has been installed to grind the lime, and an Oliver filter for the filtration of the waste calcium carbonate coming from the causticising process. There is also a caustic-soda evaporator by Messrs. Ernest Scott and Co. to evaporate 6,000 gallons of water per day. The naphtha stripping plant includes two Wilton dehydration coils for the stripping of naphtha from light oils, each having a capacity of 10,000 gallons per day. The tar acid distillation plant comprises two 20-ton stills with fractionating columns packed with Lessing rings, and a smaller still for pitching the residues. For the benzol plant two new Hodson Thomas stills with fractionating column, dephlegmators, &c., have been installed, each still having a capacity of 4,000 gallons. In addition, a Kubierschky column has been placed on an existing still. A new oil storage and loading bank is being erected, from which all oils leaving the works, either by road or rail, will be loaded.

On the Thursday morning members had a choice between a river trip down the Clyde and a cinematograph exhibition. Those who joined the former had a very pleasant cruise, with an excellent view of the shipbuilding activities on Glasgow's great waterway. Those who attended the latter saw some excellent films illustrating the mining of sulphur by the Texas Gulf Sulphur Co (lent by Chance and Hunt, Ltd.), rubber manufacture by the North British Rubber Co. (lent by the Company) and the manufacture of newsprint at Price Brothers' Mill, Kenogami, Quebec (lent by Charles Walmsley and Co., Ltd.).

One of the pleasantest excursions of the week was that on Loch Lomond. A special train conveyed a very large party to Balloch Pier, whence a steamer took them to the head of the lock and returning landed them at the lake-side village of Target. Some half-dozen of the hardier accepted Dr. Cranston's leadership in the ascent of a not very difficult hill, but the majority took the mile-and-a-half walk to Arrochar, the head of Loch Long, over the little neck of land which divides the fresh water from the sea. It was rather showery, but one forgot this under the bright sunshine which mainly prevailed, and the walk was greatly enjoyed. By four o'clock all were back on the steamer and by six were in Glasgow again, many a little envious of the facility with which its citizens may escape to the beauties of the lakes and mountains. Among the party were Dr. Ruttan, Dr. and Mrs. Armstrong, Dr. and Mrs. Levinstein, Mr. Young, Mr. Guy Radcliffe, Mr. Parrish, Professor Goodwin, Dr. Cranston, and other notable conference figures.

An enjoyable evening followed at the Royal Technical College, where the Glasgow Section gave a conversazione and dance. The college, originally founded by Professor John Anderson in 1795, is now housed in a magnificent building of recent date, the departments of which were explored under the direction of willing guides.

Here, unfortunately, our notes on the programme must end, with a lament at the better fortune of those who were able to see the full programme through. It only remains

to say that on the Saturday a large party visited the Ardeer Factory of the Nobel Explosives Co., Ltd.; on Monday there was an excursion to the Trossachs, and on Tuesday those of the members who still remained journeyed to Edinburgh, where, among other things, the new University Chemical Laboratories were inspected. It was with mixed feelings of satisfaction and regret that the members at last turned their faces homewards, and dispersed with hopes of an equally good time at some centre at present unknown next year.

Concluding Reports of the Proceedings

Messel Memorial Lecture

On Wednesday, July 5, the annual meeting of the Society of Chemical Industry was continued in the building of the Institution of Engineers and Shipbuilders, Elmbank Crescent, Glasgow, Dr. Ruttan presiding over a very large audience who had come to hear Professor H. E. Armstrong, F.R.S., deliver the first Messel Memorial lecture, the title given to which was "Rhapsodies Culled from the Thionic Epos."

The President, before calling upon Professor Armstrong to give the lecture, referred to the late Dr. Rudolf Messel as an extremely enthusiastic and able original member of the Society, to which he left £20,000 on his death. The Council had decided to use part of the sum this year for the first of a series of lectures to be known as the Messel Lectures, and to prepare a medal to be known as the Messel Medal to be given by vote of the Council to the most distinguished chemist of the time. In 1911-12, continued the President, Dr. Messel was President of the Society, and visited America where he made a host of friends and endeared himself to the chemists of New York and the sections of the Society in Canada, and probably did more than any other individual in popularising the Society of Chemical Industry in the Dominion of Canada. Dr. Messel always took a deep interest in the work of the Society and that was emphasised in the bequest of £20,000, which had not yet been fully allotted. Dr. Messel could be described as a typical chemical engineer and had developed the catalytic process for the manufacture of sulphuric anhydride and made it a commercial process. In a few years he had turned out 10,000 tons of sulphuric anhydride. That was a process which was now well known and was largely extended during the war. Before calling upon Professor Armstrong to give the lecture, he would ask Sir William Pope, who was not one of the least distinguished of Professor Armstrong's pupils, to say a few words.

Sir William Pope, F.R.S., said that the late Dr. Rudolf Messel was one of the great pioneers of technical chemistry in the Empire. He cultivated close friendships amongst the select few who were worthy of his friendship, and the fact that Professor Armstrong was an intimate friend of Messel's would alone make the choice of the first medallist an appropriate one. But the medallist of to-day had many other qualifications. Just as Messel was a pioneer in technical chemistry, so Professor Armstrong was a pioneer in technical education. Great schemes for bringing scientific technical education within the reach of everyone who was capable of benefiting by it, schemes which became realities some 40 years ago, were carried into execution by Professor Armstrong and a small band of similarly far-sighted enthusiasts. It was certain that such co-operation as now existed between chemical science and chemical technology in the Empire and in America—co-operation from which both pure and applied science had profited enormously—originated in the great campaign for technical education which Professor Armstrong and his few brother enthusiasts initiated nearly half a century ago.

Closely identified with Professor Armstrong's conceptions of scientific educational method was the idea that the student should early become imbued with that spirit of inquiry which was the source of all progress in pure or applied science. Professor Armstrong was himself a keen investigator and his name was prominently associated with the discovery of those facts and the initiation of those close relations which now formed the basis of our modern knowledge of the several branches, inorganic, organic, physical and biological, into which the complex chemistry of to-day was divided. This breadth of interest would no doubt be reflected in the vigour and scope of the Memorial Lecture which they were about to hear, and it was reflected in the fact that the audience included a large number of men who were trained with Professor Armstrong. Finally, Sir William Pope expressed himself keenly sensible of the honour which had been done to himself, one of Professor Armstrong's former students, in being asked to make a few introductory remarks to the first Messel Memorial Lecture.

Rhapsodies from the Thionic Epos

Professor Armstrong divided his lecture into several sections, in all of which he spoke in his characteristically trenchant manner. So far as the really technical part was concerned, it was devoted to the exposition of an electrolytic theory as accounting for all chemical change, but before dealing with that aspect of his subject he had a good deal to say on general matters. In the first place he complained of the lack of scientific thought and expression in the daily Press, and added that even the pages of chemical journals were full of examples of careless writing due to careless thinking. The current rumour that a free-lance journal might be established in connection with the chemical societies was an augury of a happier future "if only the pedantry of a Publication Committee of superior, elderly intolerants, without imagination," could be avoided. Free exchange of opinion and free criticism were much needed among them, even chemists, who were over-fond of using an affected attic terminology.

The need for care had been specially impressed upon us of late, owing to the attitude adopted by the Official Referee of the Board of Trade appointed under the Safeguarding of Industries Act, 1921. Nothing could be more humiliating than the manner in which, sitting as a Delphic Oracle, this gentleman had created chaos by his pronouncements upon chemistry. The discussions upon the subject in various Sections of the Society had been far from illuminating, and the lack of agreement among speakers was sufficient proof that clear thinking was not yet our characteristic. Coming back to this question at a later stage of the lecture, Professor Armstrong said that recent hearings before the Board of Trade Referee had shown that witnesses—he would not call them chemists—were not even agreed as to what is a chemical; the innocent was trapped into the belief that it was something manufactured. All things dealt with by the chemist were chemicals. A chemical could only be defined as a material which could take part in a chemical change; combustion undeniably involved chemical change, and oxygen was a chemical. "Surely it is time that we should seek to deserve the title of scientific workers and thinkers," added the Professor.

Dr. Messel and Catalysis

After giving in some detail the story of the late Dr. Messel's early training and subsequent work, the lecturer discussed the subject of catalysis and chemical action, words which, he said, might well be written at the base of the monument to Messel, because the industry which Messel had so large a share in developing was commonly thought of as one in which catalysis played a leading part. A strange confusion of thought prevailed, however, or even a strange lack of thought, because, whilst the criteria of catalysis were more or less fully discussed in recent works, there was practically no reference to the broader problem of chemical change or action. There was nothing dogmatic in the assertion that all chemical change was an electro-chemical—*i.e.*, an electrolytic process. The nature of the electro-chemical process, however, was open to argument.

The situation was one which could not well be resolved by experiment. We must proceed by way of hypothesis, as in the case of gravitation. Let the hypothesis be this: that the interaction of two diverse molecular systems is determined by the presence of a third system, itself an electrolytic system and compatible with them, in the sense that the three can be associated into a single conducting system. He would call

this third system the *determinant*, and say that every chemical change involves the presence of a determinant. He wished them to mark the word determinant and to note that the determinant was always an electrolyte. Sauce for the goose being sauce for the gander, all that he had said could be read backwards. If hydrone could not be formed by the direct interaction of hydrogen and oxygen, it could not be directly resolved into these; some determinant must intervene to bring about the decomposition. H. B. Baker had given proof of this thesis by showing, to take only a single case, that the stability of ammonium chloride is greater the more carefully it is dried. Recognising this, let us give effect to our belated conversion to a true faith by including in every equation the symbol of the determinant, E or ed, and let us not be ashamed of acknowledging it as a necessary member of any family party of chemical agents we might call together —*e.g.*, in expressing the formation of hydrone empirically, in order to show what factors are involved, let us write :—

$$(O_2\ 2H_2\ ed)=2H_2O\ ed\ ;$$

or if we wished to represent the operation as a reversible change,

$$(O_2\ 2H_2\ ed)\ (2H_2O\ ed).$$

The brackets are added to indicate that a system is involved in each case.

Absorption at Solid Surfaces

Considering some of the conditions which hasten the progress of chemical change it was pointed out that the modern work of Hardy, Langmuir and others is a justification of the view that absorption at solid surfaces is the outcome, not of a mere mechanical cohesion but of an attraction due to residual chemical affinity, and therefore selective—in fact, a function of structure. From a consideration of this aspect, Professor Armstrong said he was brought to the definition of a catalyst as something different from a determinant and to accept a statement which was commonly stressed—viz., that it is an agent which accelerates a change in being. Unlike the determinant, the catalyst was not an electrolyte but merely a solid superficies at which the interacting substances become condensed and therefore of increased concentration; hence the acceleration of the interaction and, necessarily, its value. The distinction which Professor Armstrong drew between a determinant and a catalyst was that the one is active in solution and the other in suspension. In the one case, the distribution of the components was even; in the other, it was uneven and local, the catalyst being a surface centre towards which the interacting substances were attracted.

Action of Catalysts

Unfortunately the action of catalysts, especially of enzymes, was often obscured by secondary actions, and the assumption that all chemical change must be subject to the mass action law had gained such credence that almost everywhere the temptation to twist the results to this interpretation had been irresistible. There had, however, long been a suspicion that enzymic hydrolysis took place mainly at linear rates, so long as disturbing influences were inoperative. It was permissible to say that the work done in his laboratory, especially that with urea and the enzyme urease, had raised this to a certainty, confirmed as it had been, in the most striking manner possible, by the observations made by Drs. E. F. Armstrong and T. P. Hilditch on the hydrogenation of oily fluids in the presence of very finely divided metallic nickel. If we desired to give expression to the action of a catalyst in writing an explanatory equation, this could be done in the following example :—

$$O_2\ edk\ 2H_2=2H_2O\ edk.$$

By associating the symbol of the electrolytic determinant with that of the catalyst, the fact was brought out that the former was necessary and that both factors were concerned in the operation.

In conclusion, Professor Armstrong said that during the past fifty years, as he had watched the progress of chemistry, the advance of the organic worker had been steady, and a monumental industry had grown out of their labours; the building was there upon impregnable foundations, only a few towers and turrets and features of ornament remained to be added. The foundations were of surprising simplicity—those laid by Frankland, Kekulé, not forgetting Pasteur—but they were well and truly laid and had been duly built upon. In other branches of chemistry no corresponding progress had been made, and progress had been chiefly on the practical side. There had been little conscious, systematic effort to develop a theory of chemical change; the unassailable foundation laid by Faraday had in no way been properly extended. The growth of fact had made us mere worshippers of fact—and as he had already said, the teacher had taken the place of the learner, and the teacher could but follow fashion. Whilst claiming to be members of a scientific fraternity, they were not developing and using scientific method. It was only necessary to glance at books like Mellor's comprehensive treatise, or that by Bayliss of Physiological Chemistry, to realise the bemuddled condition of our subject. Fortunately, there was evidence of a return to what Jacques Loeb naïvely called "the classical chemistry" as contrasted with colloid chemistry, exemplified by Loeb's own praiseworthy efforts to raise the character of the proteins from mere indeterminate lumps of jelly to a status of definite material, behaving in a definite orderly manner, if only put under comparable conditions; then all the rhodomontade of the colloid school could be put aside and translated into a few common-sense simple propositions. Let us recognise that chemistry is chemistry, one and indivisible; abolish sects and put pretence aside. "By our proficiency we know that we are in the way to heaven, as we know a tree is alive by its daily growth."

Calibration of Storage Tanks

Dr. J. W. M'David, in a paper on "A Rapid and Accurate Method for the Calibration of Storage Tanks," said that the volumes of storage vessels were usually determined either by measuring the vessel and calculating its volume mathematically, or by filling the vessel with water and weighing the water as it is run out of the tank. The first method was accurate only for rectangular tanks or cylindrical tanks standing on end, while the second method, though accurate, was somewhat laborious. Another method consisted in filling a tank with water, adding a known weight of a soluble salt, and then analysing a sample of the solution. There was still a fourth method which could be employed for the determination of the volumes of tanks. This method depended on the principle that water flowing through a tube or orifice under a constant head gave a constant rate of flow. This method, however, did not seem to have been much used in practice, probably owing to the fact that the degree of accuracy of such a method was not known, and also, possibly, because the amount of time taken to fit up the apparatus required, and to determine the rate of flow under a given head, made the method quite as laborious as the others. It was thought, however, that it should be possible to design, on this principle, a conveniently portable and accurate apparatus which, after being calibrated once and for all, would be available for the rapid calibration of storage tanks of all shapes and sizes. Such an apparatus was accordingly constructed, and, after a few minor alterations, was calibrated. The lecturer then gave a description of the instrument, and an account of the experiments carried out in order to determine the rate of flow of the water.

Description of the Apparatus

The apparatus was designed by Messrs. J. M. Weir, N. Taylor, and the author, and consisted of a brass cylindrical vessel 4 in. in diameter, and about 2 ft. 1½ in. in length. The vessel is open at the top, and is held in a vertical position by means of three legs, each of which carries a levelling screw. A plumb line is provided to ensure that the apparatus is set vertically. Water is supplied to the apparatus through a ¾ in. inlet cock, to which a hosepipe can be attached. A brass overflow pipe ¾ in. in diameter is provided, while a pipe of similar size delivers water to the tank to be calibrated. In the first instrument this pipe was, for convenience, made in two parts connected by means of a screw coupling, but in later instruments this coupling was omitted. The bottom of the delivery pipe is fitted with a screw thread, so as to take a nozzle. Five nozzles, of diameters ¼ in., ⅜ in., ½ in., ⅝ in., and ¾ in. respectively, were provided, so that the quantity of water delivered to the tank could be varied.

The apparatus is also provided with a funnel working on a swivel, so that it can be placed underneath the nozzle in an instant, and so divert the water from the tank which is being calibrated. A plate perforated with holes ⅛ in. in diameter, serves the double purpose of forming a support for pipes and

at the same time reducing turbulence at the surface of the water. The complete apparatus only weighs 26 lb.

From the results of three tests described in the paper, the author concluded that the calibrator was capable of giving results correct to within 0·2 per cent., provided that the depth measurements were read to that degree of accuracy.

Viscosity of Cellulose

In his paper on "The Viscosity of Cellulose in Cuprammonium Hydroxide," Dr. R. A. Joyner pointed out that Gibson, Spencer, and M'Call (Trans. Chem. Soc., 1920, 117, 484) had developed a method for the determination of the viscosity of cellulose dissolved in cuprammonium hydroxide by the falling sphere method. They found that it was most important to keep all solutions out of contact with the air before the determination was made.

In the present work a modification of this method was used which gave slightly higher viscosity values. Instead of making up the cuprammonium solution by dissolving cupric hydroxide in ammonia, the solutions were made by dissolving copper in ammonia in the presence of air. By this method solutions could be obtained much stronger in copper, which consequently gave much higher concentrations of cellulose. It was found that there was a definite relationship between the concentration of copper in solution and the amount of cellulose which could be dissolved.

Changes in Viscosity

Keeping the concentration of the cellulose and ammonia constant, the viscosity falls with increasing copper concentration to a limiting amount which is reached when the copper concentration is about 30 gm. per litre. Keeping the concentration of the cellulose and copper constant, the viscosity drops with increased ammonia concentration, and when the log viscosity is plotted against the ammonia concentration a straight line results. Keeping the copper and the ammonia constant, the viscosity rises with increase in the cellulose concentration. On plotting concentration of the cellulose against the log viscosity straight lines are obtained. On applying the Arrhenius formula $\log \frac{\text{viscosity solution}}{\text{viscosity solvent}}$ concentration $= \theta$ a constant which depends only on the nature of the cellulose.

Action of Sodium Hydroxide

In order to explain the results obtained with the action of various substances in lowering the viscosity of cellulose, that is, in lowering the value of θ the author makes the assumption that there are two kinds of cellulose—viz., cellulose A with a very high viscosity, and cellulose B with a very low viscosity. Knowing the high and low limits of θ the content of cellulose A in any particular cotton may be calculated.

The action of sodium hydroxide on the viscosity of cellulose was studied at different temperatures with varying concentrations. On the above assumption of the presence of two celluloses of widely different viscosity, the reaction appeared to obey the monomolecular law. There was little connection between the amount of sodium hydroxide sorbed by the cellulose, and its action in reducing the viscosity of cellulose, Neutral salts increased the amount of alkali sorbed without affecting greatly the viscosity reduction.

The action of N/30 and N/100 NaCl was studied at 100° C. Using acid of the above concentration, the viscosity of cellulose could be lowered without degradation products of cellulose being formed. The action with N/100 HCl was 200 times as fast as that with N/1 NaOH at the same temperature.

The quantitative action of air on cellulose dissolved in cuprammonium was determined and a simple relationship was found.

It was also found that by using sodium hypochlorite in alkaline solution the viscosity of cellulose could be reduced very quickly without any oxycellulose being formed.

Ultramicroscopic experiments failed to give any definite evidence as to the differences between high and low viscosity cellulose.

The Annual Dinner

The annual dinner was held at the Grosvenor Restaurant, on Wednesday, July 5, Dr. Ruttan presiding over a large company. After the loyal toasts had duly been honoured, Dr. E. F. Armstrong proposed "The Society."

British Chemists' Qualifications

It had been stated in the Press, and particularly in *The Times*, said Dr. Armstrong, that we had not any technical ability in this country. In rising to propose the toast of the Society of Chemical Industry he felt bound absolutely to refute, with all the energy at his command, the suggestion that we have not in this country technical ability and aptitude both to invent and to carry out commercial operations. He declared that we have in Great Britain aptitude and ability to carry out any process under the sun; that we do not want to import, introduce, smuggle or convey under any Act of Parliament, under any definition, with or without duty, any kind of foreign chemist, foreign idea or foreign brains into this country. The trouble with chemists was that they did not advertise themselves, and if they would only adopt some of the usual methods of advertisement, things would be very much better. The thing that had struck him in Glasgow was the very fine building which the Institution of Engineers and Shipbuilders had, and he hoped they would all leave Glasgow with a vow that they would leave no stone unturned, abate no jot of their efforts, until the Society had such a building. He coupled with the toast the name of their President, Dr. Ruttan, whose virtues had been sounded sufficiently already.

Dr. Ruttan, responding to the toast, spoke of the manner in which the Council had carried on the work during the year whilst he himself had been in Canada, and specially thanked Sir William Pope, who had acted as Chairman of Council during that period. The affairs of the Society were in a very flourishing condition, as were those of the five sections in Canada where a General Council had been formed to keep these sections in closer touch with each other. The result of the work of that General Council was that a meeting had recently been held in Ottawa at which some 100 members from all parts of Canada had attended. It was very important in the interests of the parent Society that this should be done. He read a letter of greeting from this General Council sent from their first meeting, and added that the relation between the Sections in Canada and the parent society were very much those of the Overseas Dominions to the Mother Country, bound by bonds of affection but without a constitution, which made them loyal supporters of the parent society in the one case and the Mother Country in the other. He expressed his complete agreement with what Dr. Armstrong had said with regard to advertisement and bringing the claims of chemistry more prominently before the notice of the public, as only in that way would they be able to influence the legislature by bringing forward a strong body of public opinion.

German Reference Books

Time would not permit him to discuss many matters he would like to, but there was one point he would bring up. The suggestion he wished to make before leaving the Chair was that renewed efforts should be made to emancipate the chemists of the universities of the Empire from the domination of German reference books. This had every prospect of success at the previous meeting of the International Union of Pure and Applied Chemistry, but for some reason we in the Empire had not taken a very active part in this very important subject. The question had been asked, especially in America, why these books of reference should be duplicated; the German books, while leaving much to be desired, were cheap and readily available. There were several reasons for this course of action. The domination of the reference shelves in the scientific libraries of the world by Germany had been an important factor in attracting graduate students to German universities, and thus inoculating, to a certain extent, the universities of the Empire with the German method. Many examples had been quoted, especially in chemistry, where the characteristic Chauvinism of the German editors had been so strong as not only to lessen their appreciation of the work of other nations but also their accuracy in recording achievements of the "auslander." That we should be in possession of English summaries of the chemical literature of the last seven years at the earliest possible date was a matter the importance of which was fully appreciated, and no more opportune time to break with the tradition of viewing chemistry "through German eyes" was likely to arise. The longer we waited the more difficult would be the task. Even if the German compendia were impartial there would still remain the

objection that to younger chemists, at any rate, the habit of consulting German works of reference—in default of others—led by mass suggestion to an appreciation of German effort in chemistry, which was by no means warranted by the facts. Moreover, the German compendia were not impartial. The almost exclusive use of German compendia and monographs throughout the whole civilised world had given that country a world-wide influence and prestige out of all proportion to the value of its contributions to knowledge.

Supremacy of British Chemistry

He hoped that in future the conditions in the Overseas Dominions and the Mother Country would be such that students would be encouraged to complete their studies in one or the other, and that the courses might be sufficiently attractive to draw students from England to complete their studies at the universities in the colonies. It must be known throughout the Empire that British chemistry was better than German chemistry. It must be known throughout the Empire that there were opportunities for gaining knowledge in chemistry in England greater than there were in Germany. That being the case, he felt sure that it would be possible to establish within the Empire reciprocity between the various universities which would enable us to maintain the prestige of English chemistry and to increase very largely the number of men who were advancing in the higher branches of the science.

Sir WILLIAM POPE, F.R.S., proposing "The City of Glasgow," spoke of the splendid hospitality which the Society had received at the hands of the Corporation, and of all those connected with the meeting in Glasgow.

The LORD PROVOST, replying, said the Corporation of Glasgow was always willing and anxious to welcome societies such as this, whose work so closely affected the health of large cities ; none more so than the work of chemists. Glasgow had a very dense population, and they wanted all the assistance they could get from the chemical societies and scientific research men to help them in their endeavour to make the city more healthy.

Mr. W. J. U. WOOLCOCK, M.P., proposed "The Honorary Secretary of the Glasgow Section," and referred to the smooth manner in which all the arrangements for the meeting had worked.

Dr. CRANSTON acknowledged the toast, and said that everybody connected with the task had done their share, and that without that help the work could not have been done.

Mr. E. V. EVANS proposed "The Glasgow Section."

Joint Meetings with Other Societies

Mr. J. H. YOUNG, Chairman of the Section, responding, said that the members of the Section in Glasgow felt that they would like to see a definite step forward as the result of this meeting. They could not expect to add many new members at the present time owing to the trade depression, but a great deal of good would be done if joint meetings with the sections of other societies could be arranged. For instance, the Glasgow Section of the Society of Chemical Industry might arrange to hold joint meetings with the Institute of Chemistry, and the same applied to Edinburgh, and the meetings might be held alternately in Glasgow and Edinburgh. This idea of joint meetings might be pushed a great deal farther than it had been hitherto, and should be applied to such places as Liverpool and Manchester, and elsewhere in the case of towns in close proximity. The idea might be applied to South Wales also, and in that way they would rub shoulders with each other to the advantage of all concerned.

Professor G. G. HENDERSON, who proposed "The Visitors," coupled with it the name of Dr. Ellwood Hendrick, of the United States, and also suggested that telegrams of greeting should be sent from the meeting to the chemists of Canada and the United States.

Profession and Business of Chemistry

Dr. ELLWOOD HENDRICK, replying, said he had come across the deep waters with very sincere, very fraternal, and very friendly greetings to the chemists in England. That task had been put upon him and he wished to discharge it now. In the short time at his disposal he wished to put forward a problem and ask them to think about an answer to it. That problem was the great gulf that existed between the profession of chemistry and the business of chemistry. He spoke only of the conditions in the United States, because he did not pretend to be well informed about either England or Canada or elsewhere. This gulf seemed to grow greater as the companies in the chemical industry grew larger. They studied long and patiently to gain proficiency in chemical science, but on the other hand no proficiency was called for in the man who engaged in the business of chemistry. The result was that the business controlled the profession in a large number of cases, although not in all cases by any means, and he could say that in the United States, speaking generally and not specifically and with many exceptions, the weakness of the chemical industry was not in the plants, not in the equipment, not in the engineering, and not among the chemists, but it was in the boards of directors. Companies had a habit of window dressing, and they put upon their boards men who had succeeded in other walks of life, the successful banker, the successful stockbroker, the successful lumber merchant. That was done in the mistaken idea that astuteness would conquer despite ignorance, but that was a mistake. In no other profession was the situation so serious. He had known a chemical speculator destroy the entire research organisation of a complex synthetic works, and then consult an excavation engineer as to how to run the factory. A chemical works was a professional institution in his opinion, and it could not be operated successfully on an unprofessional foundation.

The future of industrial nations rested with their chemists, and according to their wisdom and character so the chemical industry would flourish or fail. They could not ask for these standards from men who represented capital alone, but they asked them from professional men. They must not restrict the rights of property nor dare to destroy the initiative of capital, but he insisted that a chemical industry is a professional institution, and it could not flourish if ignorantly conducted. The chemist passed an examination for his job, and he was wondering whether some scheme could not be devised whereby all who would engage in the profession of chemistry would swear an oath to bind themselves on their honour, to seek diligently the truth by the co-ordination of the facts which alone led to the truth, to abstain from all knavery, and to address themselves to the enlightenment and welfare of humanity, striving throughout all their days to seek the light of greater understanding, and to help in bringing about a more abundant life for all mankind. In medicine and in law certain basic principles had to be subscribed to by all entering these professions, and he wondered whether something on the same lines could not be done for chemistry.

The dinner closed with the singing of "Auld Lang Syne."

Chemical Engineering Group Conference

Some Personal Impressions

[FROM A CORRESPONDENT].

THE Chemical Engineering Group of the Society of Chemical Industry selected the opportunity afforded by the Society's Annual Meeting of 1922 for its fifth conference, the subject for discussion being "Evaporation and Distillation." This subject is one of the most important of those encountered in chemical engineering practice, and it is no exaggeration to say that it was admirably treated in the four papers contributed to the two sessions of the conference. Naturally, a theme of such wide scope could not adequately be covered in many weeks of sessions, and the organisers of the conference are to be congratulated on the choice of papers made, all of them dealing with aspects of national importance of the wider subject and having, moreover, especial application to industries particularly developed in Glasgow and district. The individual papers will later receive more detailed

attention in our columns, and these few notes are, therefore, devoted to general remarks bearing upon the proceedings at the conference meetings.

The last previous conference of the group was held two years ago, on the occasion of the Society's Annual Meeting in Newcastle, and proved the outstanding success of that enjoyable gathering. Last year the transfer of the venue of the Society's Annual Meeting to Canada prevented any similar activity of the Group, and no other conference has since been held until the one under notice, largely owing to the necessity for conservative finance during the lean months of 1921. It is no secret that the excellent arrangements for the 1922 conference could not have been so satisfactorily undertaken, if at all, but for the generous financial assistance given to the Group by the Glasgow Organising Committee on the one hand and by the Council of the Society of Chemical Industry on the other. Every credit is due to these bodies for the help so opportunely afforded, for nothing had been left undone by the Group officials that could make for success, and the records of procedure and attendance at the meetings show what satisfactory results accrued from the efforts put forward.

The proceedings of the conference may be regarded as having commenced with the informal luncheon at 1 p.m. on Thursday in the week of the Annual Meeting, at the Grosvenor Restaurant. The genial Chairman of the Group, Mr. J. Arthur Reavell, presided, and under his guidance and following his excellent example, the majority of those present safely stowed away on board sufficient edible cargo to keep them reasonably steady under the storm of scientific disputation that was to follow at the first session of the conference. An adjournment to the scene of argumentative battle was made in due course, and promptly at the advertised time, with Mr. W. H. Coleman as referee, hostilities commenced. As a preliminary, the Chairman called upon the Honorary Secretary of the Group to read what might be termed the "Queensberry Rules" of the conference, and one was first thrown into a state of mortal terror at the warlike gleam in that honorary official's eye as he poured forth, like leaden shot, the words that spelt the doom of meandering argument and discursive discussion, and later left in wondering amazement at the ruthless skill with which the Chairman kept the disputants within due and decorous bounds. Too high praise cannot be bestowed upon the Chairmen at both meetings for their admirable conduct of the proceedings, for we have never attended scientific gatherings of a similar character that were carried on with such "swing" and such directness.

The first paper of the afternoon session was by Mr. Parrish, of the South Metropolitan Gas Company's Chemical Works, and dealt, in encyclopædic fashion, with the odoriferous subject of "Ammonia Stills." Encyclopædic, that is, in the printed page, for a little bird tells us that there are "Queensberry Rules" of the Group for authors of papers far more drastic as to period of peroration than those mentioned above—rules the infraction of which involves penalties that no tongue can utter nor pen describe. Be that as it may, Mr. Parrish's speech was a model of clear enunciation and lucid and brief exposition.

The second and concluding paper of the first session was from the practised pen of Mr. Walmsley, adorned with pictures from the erratic lantern of the Shipbuilders' Institute. Mr. Walmsley is, either by birth or adoption, the presiding genius of the Glasgow Corporation Chemical Works, that is to say, he is, to all intents and purposes, a Scotsman. It ill becomes a Sassenach, therefore, to sit in judgment upon him and upon what he said, much less to pass any other than admiring comment upon that collection of miscellaneous disturbance known as the Provan Works. We cannot help making this last remark, whether justified or not. Like a speaker on Mr. Walmsley's paper, we discovered in unmistakable fashion the location of a steam pipe, and we are still sore about it. We wish Mr. Walmsley would come across it too; not seriously, be it understood, but just sufficient to attract his attention. It is no comfort to us to know that the steam pipes will soon all be lagged. Rather the reverse in fact, for then the chances of Mr. Walmsley repeating our experiences will have vanished.

The evening session opened at 7 p.m. (New York time) or 7.20 p.m. (Glasgow time). The honorary secretary, to whom we subsequently mentioned this apparent horological discrepancy, explained it by referring in vigorous terms to the necessity for satisfying certain gastronomic requirements, and his description made us regret extremely that the Group did not this time follow its usual practice and arrange a dinner between the two sessions of the conference. We commend this useful custom to the Group Committee for readoption in subsequent conferences, for we maintain that it is part of the Group's duty to purvey both mental and physical sustenance throughout the whole day of its conferences.

The meeting opened under the presidency of the Chairman of the Group, Mr. J. Arthur Reavell, with a disquisition on "The General Problem of Evaporation," by Professor J. W. Hinchley, of the Imperial College of Science and Technology, London. The Professor's remarks filled us not merely with admiration of his remarkable breadth of learning and wealth of experience, but with joy at the engaging facility with which he eluded the probable onslaughts of the Chairman, by prefacing every other sentence of the concluding portion of his speech with a reference to his entrance upon the last minute of its duration. Professor Hinchley must have stolen quite ten minutes' time in this way, and we have made a note of his ingenious method for future use. Of his lecture, there is little to remark. Frankly, we did not understand all the Professor said, and we certainly did not agree with it, whether we understood it or not. Particularly did we dislike the "logarithmic mean," which seems to be one of the Professor's personal playthings and his favourite weapon of mental castigation. We are cordially in agreement with one of the critics of Professor Hinchley's paper in his remarks on this subject, and we are not to be beguiled by any specious curves or other graphical or algebraic jugglery through the medium of which this desideratum of the would-be evaporator or distiller is to be attained. We are afraid we shall continue to use the arithmetic mean or any mean other than logarithmic that takes our fancy, just as surely as we still persist in walking on the right. Nevertheless, let Professor Hinchley not lose heart; let him ignore criticism; let him continue to preach the gospel of the logarithmic mean, and we, who may perchance labour in this earthly vineyard when he shall be called to his reward, will engrave on the monumental record of his terrestrial toil that logarithmically mean inscription he wrote out so often and so carefully for our edification while he was yet with us.

The last paper of the second session of the conference was by Mr. T. H. Gray, of Nottingham, on "Glycerin Distillation," and was the means of revealing depths of commercial iniquity usually associated with brewers and bootblacks rather than with those engaged in such a holy pursuit as the distillation of glycerin. Our ears still burn after the recital, and we were not surprised to hear in the course of Mr. Gray's reply to the discussion that his works had been recently burned down. We trust Mr. Gray's personal fire insurance policies are in order, not merely here, but hereafter.

This paper closed the second session of the conference, but we were privileged afterwards to visit the Holy of Holies and assist in researches on Poiseuille's Laws and Archimedes' Principle with some of the stalwarts of the Group. We were more than charmed with all the results we helped to obtain. What transpired need not be set down here, even supposing a harassed editor could allow us space. It shall be as a sealèd book. Suffice it to say that we are more than ever convinced that where the Group foregathers, there is interest and movement; where it holds its meetings and conferences, there is scientific life vigorous and abundant.

Ammoniacal Liquor Stills

The Chemical Engineering Group of the Society held a Conference in the afternoon and evening of Thursday, July 6, when a series of papers on "Evaporation and Distillation" were read and discussed.

Mr. W. H. Coleman took the chair at the afternoon Session, when the first paper read was "Observations on the Design and Working of Ammoniacal Liquor Stills," by Mr. P. Parrish.

Mr. Parrish's paper was taken as read, but the author, in a short address, recapitulated the essential features of his paper.

It is estimated, Mr. Parrish said, that three hundred thousand tons of sulphate of ammonia are produced in the United Kingdom by the direct distillation of the ammoniacal liquors

arising from gasworks, coke ovens, and shale distillation works. It is believed that by a modification of the existing arrangement of distillation plant the cost of steam in the production of the foregoing quantity of sulphate of ammonia, which will represent to-day approximately £270,000, can be reduced to at least half this amount. The significance of the paper, as affecting the national welfare, lies in the potentialities which the contribution foreshadows in the matter of fuel conservation.

In studying the papers relative to sulphate of ammonia manufacture which have been read during the last fifty years at the various meetings of several technical associations—particularly the various associations of gas engineers—one is impressed with their descriptive character, and the absence, in most cases, of any reference to the underlying principles involved in the distillation of gas liquor. It is believed that the experience and practice of the alcohol industry, as gained by Savalle, a Frenchman, who had intimate practical acquaintance with the Coffey still, was applied to the evolution of the first continuous columnar still for the distillation of gas liquor.

Factors Governing Design

It would appear, from the form which most English-made gas liquor stills assume, that mechanical considerations such as facilities for cleaning, provision for the removal of bubbling, hoods, and initial capital costs have been the factors largely governing the design in the past. Failure to visualise the items which contribute to the cost of the manufacture of sulphate of ammonia, in so far as the still itself is concerned, is doubtless responsible for this somewhat circumscribed view. Solutions of ammonia of such strengths as are typical of normal gas liquor behave generally according to Henry's Law. Gas laws, however, whilst allowing of a ready interpretation of the conditions obtaining in the still, do not afford all the fundamentals of design. It would appear that further progress can alone result from patient observation of details such as can be obtained from practical working conditions.

Costing Considerations

Consideration of the costings as affecting ammonium sulphate manufacture reveals that still cleaning represents 0·2 per cent., labour in the operation and control of the still 4 per cent., and steam about 10 per cent. Obviously, the dominant consideration in this connection is the cost of steam. The summarised heat balance having reference to the manufacture of sulphate of ammonia reveals that the distillation of gas liquor should be a self-supporting one, assuming all available heat is capable of complete utilisation. The figures furnished show that in the distillation of 82 gallons of gas liquor (1·94 per cent. NH_3) and 18 gallons of "devil" liquor (*i.e.*, 100 gallons, or 1,020 lb., in all) the heat, reduced to pounds of steam from and at 212° F. entering the still, is as follows :—

	lb.
(1) Via steam applied	267
(2) Via preheated gas liquor	170
(3) Via cream of lime	9·3
	446·3

The heat available for utilisation is as follows :—

	lb.
(1) Via gas stream from still.....	248
(2) Via effluent liquor	198
(3) Heat arising from saturator—	
(*a*) Heat of dilution	8·1
(*b*) Heat of formation	68·8
	522·9

The ratio of steam applied to liquor distilled is 26·1 : 100.

Incidentally, the figures show, assuming no attempt is made to utilise the heat available in the waste liquor, that the efficiency of the process, from the point of view of heat conservation is only 32·5 per cent. The disability with the existing arrangement of sulphate of ammonia plant lies in the fact that there is a far larger quantity of heat leaving the saturator than can be adequately taken advantage of in the gas liquor preheaters. A special multiple effect arrangement of plant, combined with a judicious system of interchange heating, would appear to be the ideal plant to ensure a satisfactory conservation of heat so as to render the operation of the distillation of gas liquor more nearly self-supporting than it is to-day with existing plants.

Apart from the utilisation of heat which the thermal balance sheet indicates is available, continued Mr. Parrish, experiments reveal that the design of the elements of existing gas liquor stills can be improved with consequent steam economy. Progress in this direction is likely to proceed by the evolution of elements which are so designed as to ensure the promotion of optimum bubbling, with impact of the bubbles so formed. Optimum bubbling is a function of a definite vapour velocity, but the velocity should not be such as will hold up the liquid, or will cause entrainment.

Water Balance of Saturators

The question has frequently been asked, "What are the conditions governing the water balance of a saturator?" The thermal data afforded by the measurements recorded in the balance sheet are of interest in this connection. A simple calculation shows that 55 gallons of water are being evaporated per ton of sulphate of ammonia (25·74 per cent. NH_3) being made with an acid feed of about 70 per cent. H_2SO_4. The factors governing the water balance of a saturator are undoubtedly the strength of acid used, and the quantity of water which is introduced thereto.

Relative Vapour Pressures

Twenty years ago several plants for the distillation of gas liquor under vacuum were installed, and the view was expressed that with this form of plant distillation was economical as regards steam consumption, particularly at those works where exhaust steam was available. Consideration of the relative vapour pressures of typical gas liquors at ranges of pressure between 20 in. of mercury (absolute) and 35 in. (absolute) leads one to the conclusion that no great saving is likely to accrue, whereas additional expenditure of steam will be required for the operation of the vacuum pump and the pump installed to withdraw the effluent liquor from the still. Vacuum distillation may increase the rate of distillation for a given still design, but entrainment, due to possible fluctuations of the vacuum, is much more likely than with a still worked under pressure.

It is a matter of regret, said Mr. Parrish in conclusion, that the time limit imposed for the introduction of the subject does not admit of allusion to other phases to which reference is made in the paper. It is my view that finality in the design and arrangement of plant for the distillation of gas liquor has by no means been reached, and that a suitable guerdon will doubtless await the technician who devotes himself assiduously to the solution of this captivating problem.

Discussion

Mr. CHARLES COOPER said that in the author's remarks on the various designs a common feature was mentioned—viz., the large number and area represented by the serrations compared with the diameter of the gas-way. The penalty of not truly levelling when erecting the column was no doubt more heavily felt in such cases. There was one consideration which the author had hardly touched upon—*i.e.*, the entrainment of liquid from tray to tray upwards, and the manner in which it affected the efficiency of removal for a given steam consumption. Where entrainment took place in sensible quantity, two effects were felt. One of these could best be appreciated by stating the limiting case, which was what would obtain if it were possible to blow the whole of the liquor out of the still; a single stage action would be produced and any given proportion of removal would be very wasteful in steam compared with a multiple stage treatment of the same gross quantity. That considerable entrainment could take place was seen in the provision of a void, and frequently a trap, for drops at the outlet of the column. The lime-charged liquor was also liable to froth, but there could be no sharp demarcation between frothing and entrainment.

Use of the Acid Catch

Dr. E. W. SMITH said that, as the paper was an attempt to show that increased efficiency should be obtained in sulphate production, he would have liked some very strong reference in the paper to what gasworks might do for themselves before the ammonia liquor was sent to the distillery in assisting to reduce the cost of sulphate production. It was an old sug-

gestion which, now that the new Gas Act had come into force and the therm basis was standard, and illuminating power of gas was no longer necessary, and benzol was being, or should be, extracted from all coal gas, it was to him obvious that any gas undertaking which did not employ an acid catch for its ammonia extraction, prior to the purifiers, was wasting money and energy.

The CHAIRMAN said that Dr. Smith had raised a point of very great importance. It had been raised some time ago, as Dr. Smith had said, but it seemed that this was a time when it might very well be raised again. Whether he personally agreed with all that Dr. Smith had said was another matter, but the point he had raised might very well be discussed.

Mr. W. R. SIBBALD, speaking with regard to steam consumption, said his experience was that it was difficult to convince an engineer that he should use small pipes. As a matter of fact, in supplying steam to a still it would usually be found that reducing the size of pipe between the superheater and the still gave a very considerable steam economy, amounting in cases to almost 25 per cent. Another point was that it seemed to be common practice to use serrations in the hood, but he had found that this caused entrainment. He had found it an improvement to drill holes all round the hood, about 1/16th in. diameter. This gave a fine division of the gas, and brought about equilibrium much more rapidly. He then found that such a design was easily choked up, and so instead of putting 1/16th in. holes all round, a series of slots 3/32 in. wide was tried, and whilst preventing the choking, the sub-division of the gas was almost exactly the same as with the holes.

PROFESSOR L. F. GOODWIN referred to the question of intimate contact between bubbles and the liquid, which was the same type of problem in a column still or saturator as in any other type of absorption. It would be found that the depth of liquor on a plate was related to the serrated hood, and it had to be related because the slightest change in level between any of the slits with regard to the rest of the liquor led to unequal bubbling. If there was a certain minimum depth to overcome a certain minimum amount of head, there was a tendency to more uniform bubbling all round. Finally, he should think that small traces of oil or an oil film in any liquor of the sort referred to in the paper would have a great deal to do with intimate contact between the gas and the still.

Mr. A. G. BYARD (France) said he assisted in the installation of the first Feldmann still in this country. Up to that time the old egg-ended boilers were used. Referring to some points in Continental practice, he said he introduced a Wilton ammonia plant which was attached to two steam boilers, which were not overworked at the time the plant was put in, but they were overworked when the Wilton plant was installed. The latter worked quite satisfactorily, but the rest of the plant stood still. Eventually the steam was superheated, and only one boiler was found necessary instead of two. This question of superheating the steam was a point well worth study.

The CHAIRMAN, after complimenting the author on his paper, said it was the first paper that had been published in this country—he did not know about the Continent—in which some attempt had been made to apply scientific principles to the design or to ideas of designing stills for separating ammonia from gas liquor. With regard to the serrated hoods, he had distilled gases in many types of apparatus, and finally he was induced to put in a Continental still, the Mallet, in which there were serrations. With the still, the whole of the steam required to make one ton of sulphate of ammonia was represented by 9½ cwt. of coal.

Mr. Parrish's Reply

Mr. PARRISH, replying to the discussion, said that as far as the still was concerned he had attempted to itemise the loss there, and he did not wish them to confuse the loss *via* radiation between the still and the pre-heater. The pre-heaters were put outside purposely with the view to assisting in cooling the steam and the waste gases which came from the saturator, because there was such a volume apart from raising the ammoniacal liquor to boiling point—that water had to be used in order to dissipate that heat before the waste gases could be sent forward to the spent oxide burners for combustion. In connection with all the experiments he himself had conducted as regards the design of the elements constituting an ammoniaca liquor still, he had had the question of optimum velocity in mind. He had not overlooked the question of entrainment, and he could assure Mr. Cooper that so far as the stills in the paper were concerned there were very few which were calculated to cause much difficulty from the point of view of entrainment, having regard to the definite vapour velocity which they gave. In point of fact, the steam could be increased by over 300 per cent., and even then there would not be any difficulty from entrainment.

The question of turbulency was a very important matter, as he had attempted to demonstrate in the paper. It must be considered, of course, in relation to that maximum velocity which did not create entrainment. There was also another point which affected turbulency, and which also concerned the question of entrainment, and that was the question of constant steam. There were very few people throughout the country who understood the reducing valve, and singularly few who did understand the reducing valve ever attempted to control the working of it in a manner that they could ever get anything approaching constant steam conditions.

He was still investigating the question as to the maximum strength at which gasworks ought to operate their scrubbing plant in order that it might be reasonably economical, both from the point of view of the gasworks and from the point of view of the chemical works which had to deal with the ammoniacal liquor. One difficulty, so far as an acid catch was concerned when it was interposed between the scrubber and the purifiers, was the question of the entrainment of the vesicular acid which caused souring in the purifier, and by the reaction of the acid mist with the oxide of iron formed sulphate of iron. Oxide of iron in the purifier must be alkaline, and it was impossible to purify the gas until that soluble iron, which was caused by reaction of the vesicular acid with the oxide of iron in the purifier, was neutralised and the ferrous sulphate decomposed. He did not say it was impossible to use an acid catch and obviate entrainment, but there was a difficulty, and it needed to be carefully considered in connection with any such proposal. Extraordinary care was taken in aligning sulphate of ammonia stills. He was able to get them absolutely dead level, and he believed in the foundations being such that there could not be any possibility of subsidence at all. He could definitely assure them that there was absolute uniformity so far as the bubbling device was concerned. It was quite wrong to add to the depth of the slit unnecessarily because it only added to the steam consumption. The smaller the depth of the seal, consistent with ensuring uniformity, the better from the point of view of steam consumption. So far as the effect of oil was concerned, there was no ammoniacal liquor in the country that was absolutely free from oil.

Tar Distillation

Mr. W. A. Walmsley, in his paper on the above subject, first discussed the differences of initial composition and resulting fractions from tar from horizontal and from vertical retorts. He described some experiments carried out recently at the Provan chemical works of the Glasgow Corporation. These experiments appeared to indicate the presence of trihydric phenols in the higher boiling portions in vertical retort tars. They showed great affinity for oxygen, absorbing it very readily in the same way as pyrogallol.

After giving figures showing the difference in distillation range between the tar acids obtained from vertical and horizontal retort tars, the author then gave the results of a comparison between distillation ranges and physical properties.

A brief account was given of the refining operations as carried out at the Provan works, reference being made to carbolic extraction, the treatment of washed oils, and the treatment of " once-run " naphtha.

Continuous Distillation

A continuous tar distillation experiment was undertaken at the Dalmarnock works, continued Mr. Walmsley; in order to see if it were possible to run two " Wilton " dehydration coils with a small final steaming still of about 500 gallons capacity, as a continuous tar distillation plant, to produce pitch of merchantable quality. The crude tar was dehydrated in the usual way in the first coil. It was then pumped through the second coil (which was maintained at considerably higher

temperature, but at a slightly lower pressure) and released into the second vapour chamber. The residual tar then ran by gravity into the final steaming still (which was kept hot by waste furnace gases from the first coil) where it was subjected to steam distillation with superheated steam. The outlet from the steaming still could be raised or lowered to give longer or shorter time for steam distillation as might be required, whilst the thick tar was passing through continuously to the pitch coolers.

In the first experiment the temperature of the tar leaving the second coil was maintained at 280° C. at a pressure of 25 to 30 lb. per square inch, and a very soft pitch was obtained. The temperature was then raised to 300° C. and then to 320° C. at the same pressure; the resulting pitch twisted at 80-90° F. The temperature was finally raised from 350° to 360° C., and a good medium soft pitch twisting at 124° F. was obtained. In the test 22,664 gallons of dry tar were distilled with an average residue of only 27 per cent. of pitch. The author pointed out, however, that in the normal course of working the yields of oil and pitch were respectively 56-58 per cent. of oils, and 41-43 per cent. of pitch.

The treatment of the tar fractions was briefly outlined, incidental to which a description of the plant and working in the case of carbolic acid distillation and benzol distillation was given. Interesting particulars were given of the results obtained with one of the modern continuous American causticising plants, flow sheets and diagrams being supplied and figures of performance given. Experiences with modern distilling columns, *e.g.*, the Kubierschky type, were set out, and the lines of desirable further progress in tar distilling generally were indicated.

Discussion

The CHAIRMAN said the author was in charge of the tar works of the Glasgow Corporation and the ammonia plant as well. Most of them had had the opportunity of seeing what had been done at the tar works and were delighted to have heard his account of what was being done there. At the moment, all he would say was that he had been impressed by the very pretty way in which the plant had been arranged.

Mr. F. NICHOLLS asked if the author dealt with his horizontal and vertical retorts separately or together, and what advantage did he find from whichever course he pursued.

Mr. WALMSLEY said the two types of retort were dealt with together. In a very short time he would not have many horizontal retorts, and as three of the gas works would be on verticals and only one on horizontals, they had not bothered to separate the retorts.

Mr. R. MCLAUREN drew attention to the necessity for much better nomenclature with regard to different tars. It was not sufficient now to discuss tar as coal tar. There were high temperature tars and low temperature tars, and even that was not sufficient, and we should require to define tars as high temperature tar, semi-high temperature tar, medium tar, semi-low temperature tar and low temperature tar. With regard to the probability of the presence of some trihydric phenols in the higher boiling portions in vertical retort tars, they certainly found a body similar to pyrogallic acid in low temperature tars.

Mr. P. PARRISH said he had adopted many varieties of still settings, and it seemed to him that the setting which the author had adopted in his newer type of still only gave a short time contact as between the products of combustion and the still by reason of the fact that he adopted a vertical flue. He had found that from the point of view of efficiency the spiral type of flue was infinitely better. With regard to the Dorr agitator, it seemed to him that there was an optimum agitation with that apparatus, but when they went beyond that emulsions were formed. With regard to the Kubierschky column, the bubbling type of column, and Lessing rings, it was highly important that chemical engineers should arrive at some coefficient in regard to these various fractionating columns.

Mr. F. M. POTTER advocated the use of the Wilton coil with the pot still, using one Wilton coil very much on the lines laid down in the paper, using the pot still for taking off the heavy, medium, and light creosote fractions. With that system there was the advantage that one could deal with tar, however bad it might come from any gas engineer. It was almost independent, so far as frothing troubles were concerned, of the ammoniacal liquor content. The only trouble was that there was a reduction of output as the water increased. He suggested to the author that in going into the question of cracking he might endeavour to trace it by getting out a free carbon balance, as between the free carbon in the original tar and the free carbon in the final pitch. He had sometimes suspected that there might be some cracking in the Wilton coil as compared with the pot still on his small experimental units and had endeavoured to trace it by way of putting the free carbon in the tar feed against the free carbon finally present, but he had found that the formation of free carbon was in fact exceedingly small.

Mr. H. C. MARRIS referred to the fact that many of the steam pipes at the Provan works of the Glasgow Corporation were unlagged, thus allowing of great waste of heat.

Mr. CHARLES COOPER expressed the hope that the author would be able to give more information as to the working of the Wilton coils.

The CHAIRMAN said it seemed that the inventor of the pre-heater system had been somewhat forgotten in the paper. He believed the first patent taken out for this type of still, or preheaters, as they were called, was in the last century by Mr. Ellison, and he deserved the credit for it, although it was not followed up for a long time. Some years ago he (the speaker) went into the question of pre-heater stills, and he had some large scale experiments carried out to find out how much heat was available. These experiments showed that from the distillation of one ton of tar—horizontal tar—there were about 350,000 B.Th.U. available for pre-heating.

Mr. Walmsley's Reply

Mr. WALMSLEY, in reply to the discussion, said he was not in favour of the spiral arrangement of flues. Whilst there might not be the same heat efficiency in the system described in the paper, yet they must take into account the length of life and the wear and tear on the stills, because at the present time stills were expensive. He could not answer the question with regard to emulsification in the Dorr agitator because he had had no experience of it. He did not think there would be emulsification with the typhoon agitator. He had not used this type for washing the oils, but he had had oil washers and there had not been any trouble through emulsification.

He had dismantled the top portion of the second Wilton coil used in the experiment mentioned in the paper, and found from $\frac{1}{2}$ in. to $\frac{3}{8}$ in. of carbon on the top lap, about $\frac{1}{4}$ in. on the next three laps, and about $\frac{1}{8}$ in. on the following laps, and the process would be no use until that was overcome. When he examined the pitch under the microscope he found no more evidence of free carbon than before. It had been hoped that during the experiment some of the complex phenol bodies might be condensed out and give something in the nature of resins, but that had not happened, and the tar acids were the same as before. However, he proposed to give these tar acids a chance because one never knew what might happen. Therefore, it was proposed to take these tar acids and put them through the coil and get them separated first and see if by any possible means these bodies could be broken down in any way or be caused to condense out and give something of a residual nature.

Evaporation Problems

A wide survey of evaporation problems was made by Professor J. W. HINCHLEY, who opened the second session on Thursday evening, July 6, with his paper on "The General Problem of Evaporation." It had been found that evaporation could take place at any temperature under other suitable conditions, and in particular the conditions of vaporisation of liquids at atmospheric pressure and at temperatures below their boiling points were carefully examined. The influence of the hygrometric state of the atmosphere, radiation and air contact losses, were investigated, and the applications of the evaporation formulæ thus developed to ordinary drying operations were discussed. The general applicability of these formulæ to certain details of chemical engineering design was considered and the extent to which compromise between conflicting factors is occasionally necessary, was indicated. Professor Hinchley laid great emphasis upon the necessity for utilising the knowledge and experience of skilled chemical engineers in the building of drying and evaporating plant in

order to get the maximum service out of minimum plant. It often happened that minor alterations in design or equipment could increase the output of plants tremendously in excess of any saving that could be effected in the more economical use of the fuel employed in the process.

Measurement of Vapour Pressure

Dealing with the measurement of vapour pressure the author said the accurate determination of the vapour pressure in the air was becoming more and more important as the effect of air-conditioning on the output of factories was becoming appreciated. The direct determination of the dew point was often in error through the temperature or heat gradient in the instrument being comparatively great. He then showed an illustration of a convenient dew point hygrometer designed by himself, and gave a brief account of its uses.

The maximum rate at which evaporation might take place from an evaporator was not easy to determine, but everyone who had had charge of evaporators or stills would have experienced the effect of projection of the liquid from the still, either as a whole or by frothing or by ordinary entrainment. The designer of the plant, however, must fix a limit to the rate of evaporation from the surface in his particular apparatus, and it had been the author's practice to suggest the figure of 250 kilos. per sq. metre per hour. In rectifying plant, where entrainment must be avoided at all costs, this rate should not exceed 100 kilos. per sq. metre per hour. These figures did not represent the maximum rate at which any apparatus might be worked, but they did give a convenient design figure.

Temperature Drop

There was little doubt, continued Professor Hinchley, that the rate of heat transmission was proportional to the temperature drop; but since the amount of mechanical disturbance bore some relation to temperature drop and temperature level and was limited by the construction of the plant, it was found that there was no mathematical relation possible except for any particular design. It was found that with any particular type of plant or at any particular temperature level, a particular temperature drop would give a maximum rate of heat transmission. At high temperature levels this drop would be greater than at low temperature levels and with high hydrostatic heads greater than with low hydrostatic heads. With film evaporation this drop was smallest.

Discussion

Mr. P. PARRISH said he was particularly struck with the reference in the paper to the application of heat in so far as evaporation was concerned. Many of them had been face to face with the problem of concentration or evaporation of phosphoric acid. They had used lead pans with lead coils, and there had been difficulties with plant of that character. Not only was there the possibility of the formation of metaphosphates, but invariably there was the deposition of scale, which in time reduced the efficiency of the steam coil to such an extent as to render it a very inefficient piece of apparatus. The pre-heating of the phosphoric acid and then the separating of the phosphoric acid through a suitable piece of apparatus in connection with which hot air was used, got over that difficulty, and, as the author had pointed out, it was possible to use air at a fairly high temperature and yet get no difficulty from the point of view of decomposition. He would like to know if de-frothing agents had been used in connection with these plants where frothing of the liquor imposed a limit on the working capacity of the apparatus. It appeared to him that there should be some suitable reagent to prevent frothing.

Mr. H. J. POOLEY said he did not think the author made the qualification strong enough that the figure for the rate of evaporation given in the paper for plants working at the boiling point—viz., 250 kilos. per sq. centimetre—did not apply in all cases. He himself had under observation a plant which was giving as much as 2,700 kilos per sq. centimetre, and the fact that that took place without entrainment was proved quite clearly by the test figures. In connection with frothing, the question of velocity must be taken into account. The particles were ejected into the vapour through space, and the impingement of these particles one upon the other might break the surface or film, and in that way not only increase the evaporation but avoid the loss, because they were then not carried over by the velocity of the escaping vapours. He believed it was agreed that the heat pump was a totally impracticable proposition if the heat differences were increased beyond 5 or 8° C.

Mr. A. E. MALPAS said the problem that many of them had to deal with was the evaporation of concentrated solutions. The author had mentioned the evaporation of calcium chloride. That was a very important branch of industry, and it was often conducted in open vats of a very primitive type, and it had struck him as to whether, if they desired to keep the substance out of contact with the atmosphere, these pans might have a cover on them.

De-frothing Agents

Mr. A. E. ALLIOTT, referring to surface evaporation, took the concrete example of a weak liquor which tended to foam very much when it was in a very dilute state—*i.e.*, sodium tungstate and carbonate of soda combined in a very weak solution. When they put the evaporator to work upon this weak liquor, before it had been concentrated at all, it was sometimes found that it tended to boil off even when the boiling was very, very gentle. A certain amount of bubbles formed on the surface and these accumulated and one had to work very steadily until there was a certain amount of concentration. Then the trouble disappeared and did not occur again.

He did not know that there was anything he would like to recommend to prevent foaming, but when he was in Canada he saw some maple sugar solutions in open shallow pans; a string was tied on to a stick, and on the end of the string was a piece of bacon fat or mutton fat. This was left hanging over the centre of the open pan, and when the contents boiled the fat spread over the surface in a film and foaming promptly disappeared. He had heard of tallow being used to stop foaming in an evaporator, but he should not be happy in recommending it. With regard to heat transmission through tubes, it was quite certain that as the heat drop across the tubes increased they did not of necessity get a proportional evaporation.

Professor L. F. GOODWIN said he had been engaged for two years studying the problem of frothing in a very large Canadian paper pulp works. He had found that the efficiency of many of these quadruple-effect evaporators was cut down enormously by frothing. There had been cases in California with potash evaporation which took fourteen hours to work off a certain quantity, but by using a de-frothing agent they cut down that time by four hours. At the present time in some of the quadruple effect evaporators in the works he had mentioned, they were losing 20 to 30tons of soda a day. He wondered how much was being entrained, and had started an electrolytic process, and there was a system of lamps which lighted up when frothing came on in any of the effects, so that the man in charge could see what was happening. In that way there had been a tremendous improvement in the soda losses.

Professor Hinchley's Reply

Professor HINCHLEY in reply to the discussion said his view was that the logarithmic mean was the only true solution, and it was very rarely that arithmetical means were used in chemical engineering. The question of defrothing agents did not arise from the paper, but he was sure that Mr. Parrish was right in most of his remarks on this matter.

He was not called upon to discuss radiation in this question of evaporation, because he was not discussing crystallisation. He was discussing the surface problem of evaporation and its limitations.

Distillation of Glycerin

In the final paper of the Conference, Mr. T. H. Gray gave a short account of the development of the manufacture of glycerin in general, with a more detailed account of Scott's glycerin plant.

The author went back to 1779, when Scheele mentioned the "sweet principle of fats," obtained by him by digesting lead oxide with olive oil, the liquid product being glycerin in a dilute impure form. Chevreul (1813–1823) systematised the chemistry of the subject considerably. About this time glycerin was prepared solely by Scheele's method, incidentally being a substance only of scientific interest, having little or no practical value. There were various methods given for preparation of glycerin, but more often they relied on alcoholic extraction of the liquid obtained by Scheele's process, soap lyes and fat-splitting not then being known.

After referring to Cap's process (1830–1840) and Tilghmann's process (about 1854) the author commented on a number of patents relating to glycerin production, starting with patent No. 1,624, taken out in 1854 by G. F. Wilson. It was pointed out that the Belgian chemical engineer, Van Ruymbeke, who patented a notable improvement in 1893, was the designer of the large glycerin plant erected at Gretna during the war.

Chemically Pure Glycerin

Referring to the manufacture of chemically pure glycerin, Mr. Gray said this was usually attained by a double distillation, or even a third. This quality represented the height of excellence in glycerin distillation, it being colourless, odourless, free from salts of metals (as iron, copper or lead), and containing as little as 0·0050 per cent. Cl. Last, but not least, there should be a very low figure for arsenic, the present official limits being four parts per million, according to the British Pharmacopœia. Incidentally, it was highly probable that the arsenic present in such small ratio as that mentioned, distilled over in the form of a glyceryl ester, probably as glyceryl arsenite—simple distillation not being sufficient to eliminate arsenic completely.

In conclusion, the author said the progress made in glycerin distillation had, broadly speaking, gone along the following lines :—(1) Actual improvement in design of apparatus from an engineering standpoint. (2) Glycerin of to-day is practically a pure standard substance, in so far as a commercial material may be. (3) To-day, as distinct from earlier times, efficiency and economical use of energy are the points aimed at by our chemical engineers and designers.

Discussion

Mr. H. J. Pooley said he had noticed that they got chlorides down in the earlier condensers and arsenic in the later or weaker condensers. The author had said that arsenic came over as a glyceride ester, and that might probably explain the fact of it condensing at the lower temperatures. He would also like to know if the author could give some figures as to the point at which the loss occurred ; whether he had examined the foots to see the proportion of glycerin which remained as glycerin, the amount that was actually destroyed in the distillate and which probably passed over as acrolein, and the amount that passed away in the final condensing water in the jet or barometric condenser. It would also be interesting to designers to have figures with regard to the relative loss on the first and second distillation in dealing with a soap-maker's crude which contained 10 per cent. of soap, in which case the loss in the foots was likely to be greater. He had noticed that in dealing with the saponification of crude—*i.e.*, crude from the splitting of oils other than by saponification—one usually obtained a distillate of 98 per cent. yield, and that would seem to indicate that the loss on the second distillate was comparatively small.

Mr. P. Parrish said it seemed to him that the distillation of glycerin was essentially a distillation that ought to be done by means of hot oil, and he wondered whether that had been done. He had been struck by the antiquated nature of the apparatus employed and the fact that a coal fire was used in connection with the distillation of glycerin compounds.

Professor Hinchley asked that the author should explain and expand some of the practical points when he prepared the final paper. It was obvious that in the distillation of glycerin a very high vacuum was employed. In one case, a figure of 28 inches was mentioned and he understood that 13 or 14 mm. was quite common, superheated steam being employed. He gathered that the function of the superheated steam was simply that of supplying heat to the still and the question raised by Mr. Parrish as to the use of hot oil had a bearing in this connection.

Mr. Gray's Reply

Mr. Gray, replying to the discussion, said that a fire at his works destroyed the records of 15 years of glycerin distillation, but he might be able to get some further figures from some half-burned sheets that were recovered. He did not think he could answer the question put by Mr. Pooley with regard to sodium chloride. He had wondered himself what was the real reason for this in the case of a distillation from an ordinary crude, the usual thing was to find 0·02 per cent. of sodium chloride. That was a very small figure, but the amount was too much for some technical operations. He rather thought it was entrainment, but he would not like to say definitely because there were some very curious contradictions in the matter. The bulk of the sodium chloride was found in the first two condensers and very small proportions afterwards. As to foots, on second distillation they could easily get 99·5 per cent. yield. As to the amount of glycerin passing away in the final condensing water in the barometric condenser, he had collected a few tons of very weak liquor from the barometric condenser, and had boiled and boiled and boiled, and the amount of glycerin produced was negligible. In that connection he mentioned that, owing to the difficulties of the market at the present time, quantities of glycerin were being thrown away. That was an agreement between the makers here because they could not sell it. As to the use of hot oil, it was imperative to keep oil out of the glycerin, but he would look further into the point. The process of heating was by hot air and not direct flame.

The Training of the Chemical Engineer

To the Editor of The Chemical Age.

Sir,—Verily, the way of the would-be industrial chemist is hard ! At the joint meeting of the Chemical Engineering Group and the Chemical Industry Club, held to meet Dr. Ruttan, the retiring President of the Society of Chemical Industry, a variety of opinions was heard as to the method of manufacture of a chemical engineer. In Dr. Ruttan's interesting remarks on Canadian practice, the meeting was told that actual factory experience, during the College course, was a *sine quâ non* in the production of the perfect chemical engineer. Dr. Armstrong gave the emphatic message to the chemical engineering schools, " Teach Chemistry ! " and Professor Donnau said, with firm conviction, that the chemical engineer could only be a credit to his profession by means of a sound knowledge of the applications of physics. Chemistry, physics, engineering—and the greatest of these is —— ?

The slightest consideration leads, of course, to the conclusion that these three branches of science cannot be confined in water-tight compartments. It would be difficult to say that at any particular point the realm of chemistry ended and that of physics began, or that beyond an equally definite boundary for physics, engineering started. Certainly they are all interconnected, and this is perhaps better realised when the adjective " applied " is put in front of each.

In the classical instance quoted by Dr. Armstrong—the " motor-bike "—who is prepared to say that that much-maligned invention of the evil one is a result solely of a knowledge of engineering on the part of the said evil one ? It would rather seem that the devil also required some idea of physics, and even of chemistry, before the efficient motor-cycle fructuated. How could the engine of the cycle run without some physical propelling force ? And a very few miles to the gallon would be recorded if it were not for chemical knowledge applied in the production of suitable fuel.

Chemical principles cannot be applied without a knowledge of physical laws and forces ; and engineering—whether mechanical, electrical, or chemical—would not progress far without physics. Physics, therefore, appears to be the connecting link between chemistry and engineering. Now the chemical engineer claims to be the connecting link between the chemist and the engineer. The logical conclusion is that the guiding star in the education of the chemical engineer must be physics.

The would-be industrial chemist, in mapping out his University course, must without doubt give the study of chemical principles the first place, but he must not forget the tremendous practical value of an intelligent appreciation of physical laws. Can he squeeze engineering experience as well into the course ? It is doubtful.

Let the University teach him *principles*—chemical and physical—teach him to think for himself. If the training system, in trying to include a smattering of engineering, omits to lay a sound foundation of chemical and physical principles, and fails to include practice in original thinking from those principles, it is useless from the point of view of the progress of chemical engineering.—Yours, etc.,

Alan A. Drummond.

Iver, Bucks.

Safeguarding of Industries Act: Part I

Sodium Hyposulphite and Thiosulphate

AN inquiry into a complaint that Sodium Hyposulphite R and Sodium Thiosulphate R have been wrongly included in the list of articles chargeable with duty under Part I of the Safeguarding of Industries Act was opened on Friday, July 7, by the Referee, Mr. Cyril Atkinson, K.C. The complaint was brought by Messrs. R. W. Greeff and Co., Ltd., chemical merchants, London, represented by Mr. Kenneth Swan and Mr. R. Lambert Parry. There was opposition by the United Alkali Co., represented by Sir Arthur Colefax, K.C., and Mr. Stamp; and by the Board of Trade, represented by Mr. Whitehead.

The complainants, in their statement, said that sodium hyposulphite, being an inorganic product, was not a synthetic organic chemical; it was not an analytical reagent nor a fine chemical within the meaning of the Act; and it was not a chemical manufactured by fermentation processes. It was only used in negligible quantities as an analytical reagent; it was well-recognised as a heavy chemical and an industrial chemical; it had never been described in market reports or trade lists as a fine chemical, but was invariably recognised as a heavy chemical; it was manufactured by heavy chemical manufacturers; it came into commerce in a very pure condition, and the purest qualities, whether in large or small crystals, were those regularly employed in industrial processes.

The Complainants' Case

Mr. SWAN, opening the case for the complainants, said that the substance was included in the list of articles chargeable with duty under the names of sodium hyposulphite and sodium thiosulphate, and in both cases the letter R was affixed. The two substances were identical. The chemical formula was $Na_2S_2O_3$ when anhydrous, and $Na_2S_2O_35H_2O$ in the ordinary crystalline state. It was closely akin to sodium sulphate, which was Na_2SO_4, the difference between the sodium sulphate and sodium thiosulphate being that one atom of oxygen had been replaced by one atom of sulphur. The sodium hyposulphite, or sodium thiosulphate, was used in photography, and in process engraving, paper making, leather tanning, dyeing and calico printing, for medicinal purposes (in the latter connection its use was almost negligible), for extracting silver and gold from their ores, and also in bleaching as a means of getting rid of the residues of chlorine. It appeared in the British Pharmacopœia as a reagent, but not as a medicine.

The methods of manufacture of sodium hyposulphite were set out in the counter-statement of the Board of Trade, (which had been also adopted by the United Alkali Company) and he would not find much to quarrel about in that connection. The first process, which was used almost exclusively for a very great number of years, was to recover hyposulphite from alkali waste. The second process was by treating sodium sulphide solution with sulphur dioxide gas, and the third was by boiling sodium sulphite solution with sulphur. The first method was now obsolete.

The Board of Trade counter-statement pointed out that the special qualities of hyposulphite of soda covered by the items in the list were reagent and photographic qualities. The ordinary quality used in industry was not comprised within the scope of any of the items. There were three applications which necessitated the use of a better quality material than was ordinarily used in industry, namely, photography, medicine and analytical chemical work. The distinction between the photographic quality and ordinary commercial quality was well recognised, and current market reports differentiated between the two qualities. The ordinary quality was generally contaminated with impurities which rendered it slightly off colour, whilst it also commonly contained small amounts of mechanical impurities, and excessive moisture. Although the Board recognised that if they had to consider the method of manufacture alone it would be somewhat difficult to justify the view that photographic hyposulphite of soda was a fine chemical (especially were the matter considered on the basis of British practice of, say, ten years ago), the manufacturing processes in respect of this particular substance had been subject to serious changes in recent years, and the Board submitted that, even having regard to the nature of the manufacturing processes alone, hyposulphite of soda of the quality mentioned was, in modern practice, properly considered to be a fine chemical. The Board urged that hyposulphite of soda was produced by firms which manufactured other fine chemicals; it was one of the most important of the photographic chemicals, a class of chemicals specifically mentioned as a sub-division in the trade classification of fine chemicals; it reached a very high standard of chemical purity, and the work involved in producing the pure quality material necessitated an increase of price over that of the industrial material approximating to 50 per cent.; and it was properly regarded as a fine chemical. The Board submitted that hyposulphite of soda of reagent and of photographic quality was properly regarded as a fine chemical.

Accurate figures of relative manufacture in this country and importation could not be obtained, but his evidence would be that by far the preponderating amount consumed in this country came from abroad. It was dealt with on a large scale, comparable with the manner in which other admittedly heavy chemicals were bought and sold, not only in the case of what the Board of Trade admitted to be the commercial quality, but also in the case of that referred to as photographic, and which he would refer to as pea crystals. The Board of Trade apparently did not suggest that what they called commercial quality was a fine chemical, but had taken up the position that a certain grade or quality must be treated as a fine chemical for the purposes of the Act, and they had inserted the letter R in the list to indicate under what circumstances the chemical had to be so treated. According to the language used, the special quality indicated was a special quality of purity, and not a special physical quality. His submission would be that the Board of Trade had no justification at all for putting the letter R against an admittedly heavy chemical such as hyposulphite of soda.

THE REFEREE said that if they had "pure," "puriss," and "extra pure," "pure" would mean relatively pure.

Mr. SWAN agreed. He pointed out the enormous range which the word "pure" would cover in the mind of a chemist and, at the same time, the extraordinary vagueness and uncertainty of it.

Evidence of Trade Witnesses

Mr. A. G. GILBERT (chemical merchant) said he had had 35 years experience of the trade. He had always been described as a heavy chemical merchant, and had dealt with sodium hyposulphite during the whole of his business experience. In his experience, sodium hyposulphite was a heavy chemical, and he had dealt with it in lots of 10 tons, 1 ton, etc. He believed the difference between the large and the pea crystals was merely a matter of appearance, and he did not recognise any difference as to purity. The present price of large crystals was about £14 per ton, and the pea crystals £17, or possibly £18 per ton. Usually the pea crystals were packed in 1 cwt. kegs, and the others in bags or casks, and the difference in packing accounted for the bulk of the difference in the price of the hypo. He produced samples of large and pea crystals. The bulk of the sodium hyposulphite he dealt with was sold to wholesale and manufacturing chemists, whilst a large quantity went to tanners, photographic film people, etc. The pea crystal form was a heavy chemical equally with the commercial.

Replying to questions by Sir Arthur Colefax, who cross-examined, and who produced a number of trade journals with a view to proving that the difference in price between the large and small crystals was something in the neighbourhood of 50 per cent., the witness said that the quotations given in trade papers were most erratic, and could not be relied upon by anyone in the trade. He admitted that a good deal of the hypo with which he dealt came from Germany, and, in reply to Sir Arthur's remark that very little foreign hypo was coming into the country at present, said that very little of any chemical was coming in. Replying to further questions, he said that the small purchaser of photographic hypo did want something which had been carefully protected from impurities, and agreed

that the kegs containing photographic hypo were paper lined. Asked whether he would agree that the photographic hypo was in the form referred to as pea crystals, the witness said that that which was sold in small quantities was, but he should say that the film people would never pay the extra price for the pea crystals.

Mr. A. F. BUTLER (a director of Messrs. R. W. Greeff and Co.) said that in his experience sodium hyposulphite was a heavy chemical, and had been treated as such. Price lists issued by his firm were referred to, to show that the percentage difference between the prices of the two forms of hypo was smaller than that suggested by Sir Arthur Colefax. Before the war his firm handled about 50 per cent. of large crystals and 50 per cent. of pea crystals, but at the present time those handled were pea crystals principally. To the best of his knowledge the difference between the pea and commercial was a difference in form. The commercial crystals were sold to tanners principally, and, to a smaller extent, to the textile trade. The pea crystals went to photographic firms and to chemists. He regarded the terms " pea " and " photographic " as synonymous. The difference in price was accounted for partly by the difference in the packing, and also because the pea crystals were a nicer looking form.

Imports of Sodium Hyposulphite

Cross-examined by Sir Arthur Colefax, the witness agreed that there was not much foreign hypo coming into the country at the present time. Before the war very large quantities were coming in of both qualities. Photographic firms bought the pea crystals almost entirely, and he agreed that, in his experience, photographic firms were particular about the substance, and demanded a high degree of freedom from contamination.

Sir ARTHUR COLEFAX then referred to a price list of fine chemicals and pharmaceutical products, issued by Messrs. Greeff and Co., in January, 1922, in which " Sodium Hyposulphite, Rhodia," was mentioned, and asked why hypo was included in that list.

The witness said that that was because the list was the only one issued to manufacturing chemists at the present time ; it had a general heading " Fine Chemicals and Pharmaceutical Products," but there were included in it such heavy chemicals as were sold to those trades.

Sir ARTHUR COLEFAX said that in January, 1922, when the firm were making a distinction in their price lists between technical chemicals and other chemicals, they did not put the sodium hyposulphite in the technical chemical list, but when they issued a list of fine and pharmaceutical chemicals they put it into that.

Sir ARTHUR COLEFAX said that a reasonable person would perfectly properly draw the inference that Messrs. Greeff and Co., were treating sodium hyposulphite as a fine chemical.

The witness would not accept that.

Mr. R. J. KINDON (Messrs. Charles Zimmermann and Co., Photos, Ltd.) said he did not regard hypo as a fine chemical, but recognised it as being sold in commercial crystals and pea crystals. In his experience hypo was always treated in the trade as a heavy chemical. He was concerned with the photographic trade entirely, and the hypo he sold was almost entirely in the pea crystal form. His firm introduced a very fine pea crystal about twenty years ago.

Complaints of Unfair Taxation

Reference was made by the witness to some hypo which was obtained from the A.G.F.A. Company, of Berlin. The hypo was in the form of pea crystals, but was of commercial quality ; there was only one quality of " Agfa " hypo. He asked the company to state specifically on the invoices that the hypo was of commercial quality, if that were actually the case, for the benefit of the Customs, and this had been done, but he had been taxed. He had asked on what grounds the substance was taxed, and on what tests, but Dr. Fox, the Government Chemist, had refused to give any details.

The REFEREE remarked on the fact that no one knew what degree of purity brought sodium hyposulphite within the scope of the letter R. It was analysed, those concerned were not told what the analysis was, and nobody knew whether their stuff was properly taxed or not.

(To be continued)

From Week to Week

PROCTOR, JOHNSON, AND CO., chemical manufacturers, 17, Withy Grove, Manchester, inform us that they will shortly remove their offices to 95, Corporation Street, Manchester.

We understand that Mr. A. I. DU PONT, of E. I. du Pont de Nemours and Co., Inc., who visited this country for his daughter's wedding, has now returned to the United States.

THE LIBRARY of the Chemical Society, Burlington House, London, will be closed for stocktaking from August 7 to August 19, and will close each evening at 5 o'clock from August 21 to September 16.

Mr. A. G. ELLIOTT, B.Sc., the son of Dr. G. R. ELLIOTT, founder of Elliott Brothers, Ltd., manufacturing chemists, Sydney, has been admitted as partner in the firm of Grimwade, Ridley and Co., St. John's House, 124 to 127, Minories, London.

The first application form for membership and associate membership of THE INSTITUTION OF CHEMICAL ENGINEERS is now being issued. Copies of this form are obtainable from the Hon. Secretary, Institution of Chemical Engineers, 166, Piccadilly, London.

Mr. E. BROTHERTON-RATCLIFFE, of Brotherton-Ratcliffe and Co., Ltd., chemical merchants, Winchester House, Old Broad Street, London, and a nephew of Sir Edward Brotherton, M.P., has been adopted as the new Independent Liberal candidate for Leyton.

A new reduced scale of RAILWAY CHARGES ON MERCHANDISE TRAFFIC by goods train, which will take effect on August 1, will generally make the rates and charges 75 per cent. above the rates in operation on January 14, 1920, in place of 100 per cent. above such rates, the reduction to apply both to class and exceptional rates.

At Oxford University, on June 28, the HONORARY DEGREE of D.Sc. was conferred upon Professor J. Perrin, of Paris, and Professor F. Gowland Hopkins, of Cambridge. The Public Orator referred to Professor Perrin's researches on the character and constitution of the atom, and to Professor Hopkins's work in biochemistry.

Sentence of five years penal servitude was passed at Stafford Assizes on Tuesday on Mr. John Walter Knowles, found GUILTY OF MANSLAUGHTER consequent on the Tipton ammunition explosion last March, resulting in the death of nineteen girls. Mr. Eber James Richard Chadwick, works manager, was found not guilty and discharged.

According to the BOARD OF TRADE RETURNS for June, imports, exports, and re-exports all show a falling off in values totals as compared with May. It is encouraging to note, however, that the reverse is the case in regard to chemicals, drugs, dyes, and colours, the imports, at £878,489, being £36,101 more in value than the May imports, while exports, at £1,784,111, show an increase of £36,010.

Addressing members of the Aldwych Club, London, on Tuesday, SIR ERNEST BENN said it seemed to him that Europe to-day was obviously the biggest and most promising market that had ever been known. Business men had to find out what the conditions were, and see how far, if at all, they could operate on those conditions to their advantage. It was for them to consider how far it was possible to bring about that simple thing, the exchange of goods.

At the closing session of the Armaments Commission of the League of Nations, in Paris, on July 7, a resolution was approved having as its object the RESTRICTION OF CHEMICAL WARFARE by mobilising scientific opinion against it and bringing to the consciousness of the world the frightful possibilities of poison gases in international conflicts of the future. It was decided to ask the newly formed committee of " intellectual co-operation " to recommend a means of enlisting the help of men of science by making public their discoveries.

At a special general meeting of the BRITISH ASSOCIATION OF CHEMISTS, held in Manchester on July 8, a resolution was passed confirming the results of the ballot on the Unemployment Benefit Scheme and authorising the Council to proceed with its registration as an addition to the rules of the Association. It was also agreed that the rules for the Unemployment Fund be put into immediate operation and that subscriptions should be payable as from July 1, 1922. A general discussion then took place in the course of which Mr. A. S. Mills gave an account of the working of the Unemployment Bureau and of certain rebates allowed by the Income Tax Commissioners.

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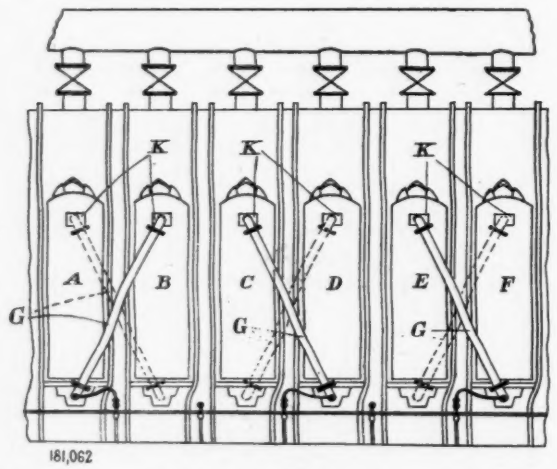
181,058. Prussic Acid, Manufacture of. Deutsche Gold & Silber Scheide-Anstalt vorm. Roessler und O. Liebknecht, Weissfrauenstrasse 7/9, Frankfort-on-Main, Germany. Application date, February 7, 1921.

Hydrocyanic acid is produced by heating a mixture of gases containing carbon, hydrogen and nitrogen, with or without steam in a high tension arc preferably at a pressure greater than atmospheric. In an example, a gas mixture containing carbon monoxide 5·3 per cent., methane 18·3 per cent., hydrogen 33·7 per cent., and nitrogen 42·7 per cent., is heated in a high tension arc of 3 kilowatts and at atmospheric pressure. A yield of 16·6 grams of hydrocyanic acid per kilowatt hour is obtained. If the pressure is increased to 1·6 atmospheres, the yield is 20·8 grams per kilowatt hour.

181,062. Hydrogen, Methods and Apparatus for the Production of. Cumberland Coal Power and Chemicals, Ltd., J. H. West, and A. Jaques, 31-32, Grosvenor Place, Westminster, London. Application date, February 9, 1921.

The object is to obtain an increased proportion of hydrogen in the gases evolved during the carbonisation of coal. The gases evolved during the initial carbonising stage are mixed with steam and passed over partly carbonised coal or coke which has been heated to 1000°-1100° C. The carbonisation is effected so slowly that most of the hydrocarbon products, including tar, methane and ethylene, are decomposed and hydrogen is liberated. A battery of six coke ovens is arranged so that the ovens work in pairs, A B, C D, and E F, and the two ovens of each pair are connected by pipes G which are detachably attached to the doors K. A small steam pipe projects into each pipe G. Assuming that the carbonisation is in its initial stages in the ovens B, C, E, the gases rich in hydrocarbons are passed from these ovens through the pipes



181,062

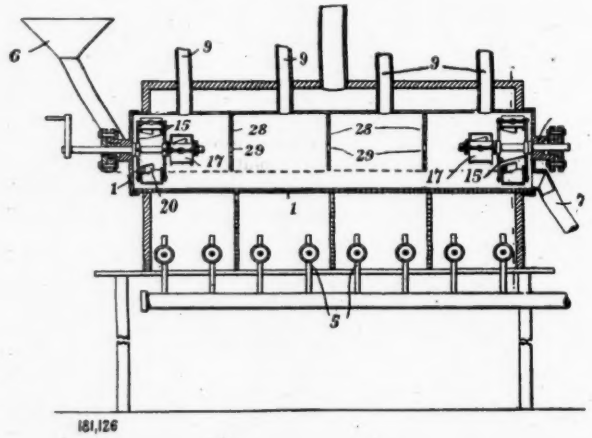
G into the ovens A, D, F, together with steam. The temperature in these ovens is considerably higher, and the gases are dissociated into hydrogen and carbon, the latter reacting with steam to yield carbon monoxide, carbon dioxide, and hydrogen. When gas is no longer evolved from the ovens A, D, F, they are discharged and refilled with fresh fuel, while the pipes G are reversed as shown in dotted lines, and the gases are then led from the cooler ovens A, D, F to the hotter ovens B, C, E. It is found that the presence of steam prevents the deposition of carbon on the retort walls. If vertical gas retorts of the continuously working type are employed, the gases are drawn off below the zone of maximum temperature and then treated with steam in the zone at higher temperature. The duration of the initial carbonising period is about 15 hours. The hydrogen is separated from the gaseous mixture, and may be used for the synthetic production of ammonia.

181,123. Vacuum Filtration of Colloidal Matter from Liquid Mixtures. W. Mauss, 72, Cullinan Buildings, Simmonds Street, Johannesburg, Transvaal. Application date, March 8, 1921.

In using a vacuum filter for treating substances such as sugar juice, a shaft carrying a number of sector-shaped filter leaves oscillates through about 270 degrees, so that the leaves are first immersed in a tank containing the liquid and suction is applied to the interior of the leaves through the hollow shaft. The clarified liquid is drawn through and a gelatinous cake is deposited on the filter. The filter leaves are then rotated to a stripping tank, but it has been found difficult to remove the gelatinous cake by the usual application of internal pressure. In the present invention nozzles are arranged radially and very close to the surface of the filter leaves. Each nozzle is provided with numerous perforations arranged in a line and covered by a parallel cover-plate so arranged that the water is projected in a thin sheet against the filter cake at a small angle. The water is projected at very high velocity and the filter leaf is moved slowly past the jet. It is found that the cake is stripped off the filtering surface as a continuous sheet. A slight internal air pressure is imposed during the stripping operation.

181,126. Bituminous Shales, Treating. J. H. Ginet, 1244, Downing Street, Denver, Colo., U.S.A. Application date, March 9, 1921.

The apparatus is for recovering oil by the distillation of bituminous shale, and the shale is subjected to a gradually increasing temperature in successive zones, so that all the available gas is liberated in each zone before the material passes to the next, and is drawn off without being subjected to a higher temperature. A retort 1 is heated by a furnace 5 divided into zones having an increasing temperature from one end of the retort to the other. Shale is supplied at one end from a hopper 6, and the spent material is drawn off at the other end by a pipe 7. The retort is divided into sections by partitions 28 depending from the roof, and outlet pipes 9 are provided for each section. A rotary shaft passes concentrically through the retort, and through openings 29 in the



181,126

partitions. The shaft carries radial arms 15 to which are attached shovels 17 in pairs, the successive pairs being at an angle to one another. Guides 20 are provided on the shovels so that the shale is lifted and then deflected in a shower through the retort on to the next pair of shovels, and so on through the retort. The shale is thus kept in constant movement without the formation of mounds with resultant uneven heating which is liable to occur when screw conveyors are used. Each shovel is arranged at an acute angle to the floor of the retort, and is provided with perforations and ridges formed by stamping out tongues of material from the shovel.

181,132. BLEACHING EARTHY MINERALS THAT IN NATIVE DEPOSITS ARE STAINED BY COLOURING MATTERS THAT RENDER THEM USELESS FOR INDUSTRIAL PURPOSES. A. J. Stubbs, 6, Calle de Ximenez, Castellon de la Plana, Spain. Application date, March 12, 1921.

It is usually found that natural deposits of kaolin, barytes, feldspar, bauxite, etc., are stained by oxides and other metallic compounds. In this invention the coloured material is placed in a vessel with water and some metallic zinc, iron, or platinum. Sulphur dioxide is then passed into the water to saturate it, and is reduced to hyposulphurous acid by the catalytic action of the metal. The coloured ingredients are oxidised by the oxygen liberated, and rendered soluble in the hyposulphurous acid. The remaining mineral matter is pure white and may be washed and dried. The coloured solution obtained may be treated with lime or alkali to precipitate the metallic oxides, which may be used as pigments.

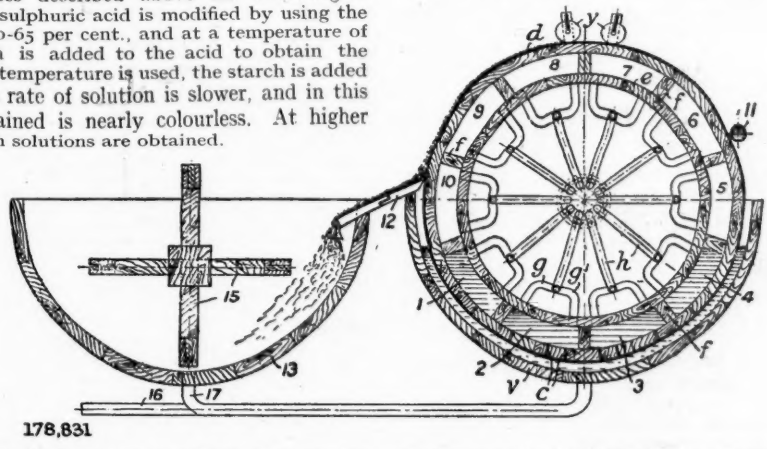
181,153. CALCIUM HYPOCHLORITE, PROCESS FOR RENDERING STABLE. Chemische Fabrik Griesheim Elektron, 31, Gutleutstrasse, Frankfurt-on-Main, Germany, and H. Reitz, 7, Mittelstrasse, Bitterfeld, Germany. Application date, March 23, 1921.

The object is to render commercial calcium hypochlorite stable and readily soluble. The dry calcium hypochlorite powder is mixed with sodium chloride, which must be free from magnesium chloride which is hygroscopic. The substances are mixed in such proportions that 100 parts of the mixture contain at least 10 parts of active chlorine. The mixture may be pressed into blocks, in which the calcium hypochlorite is stable as well as soluble in water.

181,197-8. COMPOUNDS OR MIXTURES OF STARCH AND STARCHY MATTER AND SULPHURIC ACID, MANUFACTURE AND PRODUCTION OF. Courtaulds, Ltd., 19, Aldermanbury, London, and W. H. Stokes, 11, Lydate Road, Coventry. Application date, April 23, 1921.

181,197. In the preparation of a setting bath for use in the manufacture of threads, filaments, strips, or films, from viscose, it is found that when starch is added to 60 per cent. sulphuric acid, it becomes gelatinous and lumpy, and a homogeneous mixture can only be obtained with difficulty. In the present invention, the finely divided starch is mixed with water or with dilute sulphuric acid at such a temperature that gelatinisation does not take place. Sufficient concentrated sulphuric acid is then poured into the mixture to bring it to the required concentration. The mixture is thick at first but then becomes thin. The acid must be added quickly so that the addition is completed before thickening takes place.

181,198. The process described above for obtaining a mixture of starch and sulphuric acid is modified by using the acid of a strength of 50-65 per cent., and at a temperature of 35°-75° C. The starch is added to the acid to obtain the solution. If the lower temperature is used, the starch is added more slowly, since the rate of solution is slower, and in this case the solution obtained is nearly colourless. At higher temperatures, brownish solutions are obtained.



178,831

181,239. LEAD-BEARING MATTES AND THE LIKE, TREATMENT OF. F. E. Elmore and The Chemical and Metallurgical Corporation, Ltd., 701, Salisbury House, London, E.C.2. Application date, June 11, 1921.

The process is particularly applicable to the treatment of lead-bearing metallurgical products consisting essentially of metallic sulphides obtained by fusion, such as matte consisting of sulphides of iron, copper, lead and zinc. The matte is powdered and treated with a hot saturated solution of sodium chloride containing hydrochloric acid, sulphuric acid or alkali bisulphate. The mixture is heated to boiling point for about one hour, and practically the whole of the lead and part of any silver present pass into solution. The solution is filtered off from the other unattacked sulphides, and the lead and silver recovered from it by known methods. The chloride solution may be used again. Other chlorides may be used such as potassium, calcium, magnesium or ammonium chloride. The acid added is selected in accordance with the chloride used, *e.g.*, hydrochloric acid is used with calcium chloride to avoid precipitation of calcium sulphate. It is found that only about 0·5 per cent. of lead remains in the residue. Arsenical mattes may be similarly treated.

181,255. PHOSPHORIC ACID, PRODUCTION OF. A. Kelly, 57, Chancery Lane, London, W.C.2. Application date, July 15, 1921.

In the usual manufacture of phosphoric acid from mineral phosphates, it is found that the organic matter present produces a discolouration of the product due to the action of the sulphuric acid on it. It is then necessary to bleach or decolourise it. In this invention, the mineral phosphate is first roasted to carbonise all the organic matter, and is then treated with sulphuric acid. The roasting is effected in a kiln or muffle furnace at 800° C., and an evenly distributed and active decolourising carbon is obtained throughout the mass. The subsequent bleaching is thus eliminated.

NOTE.—Abstracts of the following specifications, which are now accepted, appeared in THE CHEMICAL AGE when they became open to inspection under the International Convention: 157,794 (K. W. J. H. Jacobs), relating to improving inferior brown coals and peat, see vol. iv, p. 456; 157,795 (K. W. J. H. Jacobs), relating to a substitute for gas coal, see vol. iv, p. 456; 161,195 (L'Air Liquide, Soc. Anon. pour l'Etude et l'Exploitation des Procédés G. Claude), relating to synthetic ammonia, see vol. iv, p. 654; 167,738 (Trent Process Corporation), relating to separation of oils, see vol. v, p. 464.

International Specifications not yet Accepted

178,831. FILTERING LIQUIDS. J. B. Vernay, 17, Rue du Gaz, Villeurbanne, Rhône, France. International Convention date, April 23, 1921.

A rotary filtering drum *c* is covered with filter cloth *d* and mounted within a concentric trough *v*. An inner drum *e* is arranged concentrically with the drum *c* and the annular space is divided into a number of compartments 1 . . . . 10. Each compartment is connected by pipes *g*, *g*¹, *h* passing through one of the bearings of the drum to a disc valve. Suction is applied to those compartments 1, 2, 3, 4, which are immersed in the liquid to be filtered, so that solid matter is deposited on the filter cloth, while the filtrate is drawn off through the pipes *h*. When these compartments emerge from the liquid, air is drawn through the deposited material so as to dry it, and a spray 11 may also be provided. The material is finally removed by a scraper 12 to a vessel 13 having an agitator 15, and, if too liquid, may be passed again to the filter through pipe 17. Suction is not applied to the compartment passing the scraper.

179,544. Urea Salts and Manures. Soc. d'Etudes Chimiques pour l'Industrie, 8, Quai du Cheval Blanc, Geneva. International Convention date, May 3, 1921.

A concentrated solution of free cyanamide is treated with sulphuric acid and a salt such as nitrate of alkalies, alkaline earths, or ammonium, or chloride of sodium, potassium, magnesium or calcium. The corresponding urea salt is obtained and may be crystallised out or the mixture may be used directly as a manure. If an alkali nitrate is used, a filtrate of ammonium sulphate is obtained, which may be mixed with calcium nitrate, filtered, and evaporated to obtain ammonium nitrate.

179,550. Gas Manufacture. R. E. Thwaites, Castlewood, Brisbane Street, Toowong, Brisbane, Australia. International Convention date, May 5, 1921.

A continuously operated vertical retort for distilling coal, lignite or shale is shown in sectional plan in Fig. 1 and sectional elevation in Figs. 2 and 3. The retort is situated between horizontal combustion flues 24, 46, separated by partitions 13, and arranged in pairs. Producer gas passes through vertical flues 31, and ports 44 to the flues 24, while the air supply is

FIG. 1

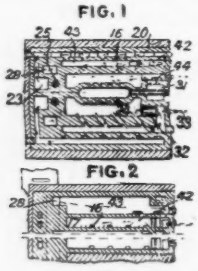
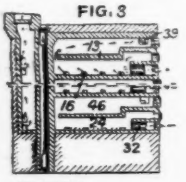


FIG. 2

FIG. 3



179,550

preheated by passing through vertical flues 28, horizontal flues 43, 17, and inclined ports 16 to the combustion flues. The burnt gases pass out through ports 39, and horizontal flues 20 to the outlets 23. Water gas or stripped coal gas may be used for firing, and may be supplied to the nozzles 32, while the air supply is preheated as before. The heavy oils distilled off may be returned to the retort to be converted into gas.

179,928. Crucibles. M. de Roïboul, 18, Avenue de Villiers, Paris. International Convention date, May 12, 1921.

A crucible suitable for refractory minerals is composed of a mixture of zirconium oxide 60-80 per cent., yttrium oxide 13-17 per cent., erbium oxide 5-20 per cent., with or without thorium oxide up to 10 per cent. The erbium oxide may be replaced by cerium oxide or beryllium oxide.

179,934. Fertilisers. A. d'Ercole, 9, Piazzale Flaminia, Rome. International Convention date, May 14, 1921.

Calcium phosphate is treated with sulphuric acid until disintegrated, and then calcium cyanamide and water are added, and the reaction allowed to proceed.

179,951. Formaldehyde. A. Heinemann, 23, Dorfstrasse, Tempelhof, Berlin. International Convention date, May 11, 1921.

A mixture of carbon monoxide, hydrogen and steam is passed over a contact substance such as unburnt porcelain, pumice, asbestos, coke or charcoal, coated with metallic copper or nickel, which is heated to 240°-350° C.

179,961. Pigments. O. Brandenberger, 12, Zeppelinstrasse, Zürich, Switzerland (Assignee of P. Peters, Müllheim, Switzerland). International Convention date, May 14, 1921.

Metallic lead, or the residue obtained from molten lead or lead compounds, is heated nearly to its melting point (327° C.) with oxygen. The product is mainly the oxide Pb_2O with some PbO, and may be ground and mixed with a binder for use as a paint. Alternatively the product may be used for a filling or insulating material or for impregnating fibres.

Latest Notifications.

182,459. Process for improving artificial resins. Consortium für Elektrochemische Industrie Ges. June 29, 1921.

182,487. Process of oxidising aromatic compounds. Eckert, A. July 2, 1921.

182,488. Cellulose solutions. Nitrogen Corporation. July 2, 1921.

Specifications Accepted, with Date of Application

159,815. Crystallisation, Process of—and apparatus therefor. Soc. Générale d'Evaporation Procédés Prache and Bouillon. March 5, 1920.

162,624. Metallurgical furnaces. H. D. Hibbard. April 29, 1921.

163,323. Hydrogen and ammonia, Preparation of. Nitrogen Corporation. May 14, 1920.

165,721. Halogen derivatives of basic acridine dyestuffs, Manufacture of. Durand and Huguenin Akt.-Ges. June 30, 1920.

169,688. Aromatic aminonitro compounds, Process for the preparation of. Soc. Chimique de la Grande Paroisse. September 30, 1920.

181,775. Titanium dioxide from bauxite, Process for the preparation of. E. E. Dutt and P. C. Dutt. February 18, 1921.

181,794. Drying and distillation of carbonaceous substances, Apparatus or kilns for. H. Alexander. March 15, 1921.

181,802. Rubber, Process for heat vulcanisation of. R. Wheatley and Victoria Rubber Co., Ltd. March 17, 1921.

181,811. Cement manufacture. Merz and McLellan (Firm of) and E. G. Weeks. March 17, 1921.

181,831. Metallic powders, Process for the manufacture of. W. M. Gillespie and P. Buckley. March 21, 1921.

181,835. Liquid esters of phosphoric acid, Manufacture of. A. G. Bloxam. (*Chemische Fabrik Griesheim-Elektron.*) March 22, 1921.

181,837. Oxides of tungsten and molybdenum, Reduction of. R. E. Pearson, E. N. Craig, and Durelco, Ltd. March 22, 1921.

181,848-9. Electro-chemical reactions, Processes for carrying out—and apparatus for use therein. G. Plauson. March 24, 1921.

181,863. Furnaces for metallurgical and analagous purposes. Wellman-Smith-Owen Engineering Corporation, Ltd., and A. V. Kemp. April 1, 1921.

181,865. Glue, Manufacture of. Plauson's, Ltd. (*H. Plauson.*) April 2, 1921.

181,875. Electrically heated muffle furnaces. Akt.-Ges. Brown, Boveri et Cie. April 4, 1921. Addition to 159,195.

181,877. Mixing, reducing or grinding or like machines. J. McIntyre. April 6, 1921.

181,879. Rotary filters. H. A. Vallez. April 6, 1921.

181,884. Dry neutral sulphate of ammonia, Manufacture of. Ebbw Vale Steel, Iron and Coal Co., Ltd., and D. Thickins. April 9, 1921.

181,894. Retorts. Low-Temperature Carbonisation, Ltd., and T. M. Davidson. April 18, 1921.

181,898. Magnetic separators for removing solids from liquids. E. B. Chapman. April 22, 1921.

181,920. Mixing machines. F. E. Adams, G. H. Adams, and T. D. M. Linkie. May 7, 1921.

181,923. Detergent. G. F. R. Pineger. May 9, 1921.

181,984. Recovery of sulphur, metallic sulphides, and the like from a condition of emulsion without filtration or evaporation. B. Hunt. March 16, 1922.

182,031. Colouring matters, Manufacture of. British Dyestuffs Corporation, Ltd., A. G. Green, K. H. Saunders, and E. B. Adams. August 30, 1921.

155,592. Synthesis of ammonia. Nitrogen Corporation. December 20, 1919.

181,750. Soluble acid colouring matters and intermediates, Manufacture of. A. G. Green, K. H. Saunders, and British Dyestuffs Corporation, Ltd. December 18, 1920.

Applications for Patents

British Alizarine Co., Ltd. Discharging agents, and processes employing same. 18522. July 6.

Chemical Research Syndicate, Ltd. Motor fuels. 18605. July 6. (United States, October 27, 1921.)

Chemische Fabrik Griesheim-Elektron. Method of casting oxidisable metals. 18503. July 5. (Germany, October 27, 1921.)

Baum, G., and Chemische Fabrik Weissenstein Ges. Anodes for forming percompounds. 18740. July 7.

Consortium für Elektrochemische Industrie Ges. Process for improving artificial resins. 18479. July 5. (Germany, August 12, 1921.)

Munro, L. A. and Freeth, F. A. Production of ammonium chloride and sodium carbonate. 18758. July 8.

Ges. für Kohlentechnik. Separation of ammonia and benzol hydrocarbons from coal distillation gases. 18489. July 5. (Germany, July 7, 1921.)

Harris, H. F. Production of alcohol. 18482. July 5.

Major, J. L. Distillation, etc., of liquids. 18807. July 8.

Petroff, G. Production of phenol formaldehyde condensation products. 18712-3. July 7.

Salerni, E. M. Retorts for distillation or heat treatment of carbonaceous, &c., materials. 18390. July 4.

Thomas, J., and Scottish Dyes, Ltd. Manufacture of dyestuff intermediates. 18804. July 8.

Teillard, A. L. A. Process of purifying sulphate of baryta, &c. 18576. July 6. (France, July 18, 1921.)

Threlfall, Sir R. Manufacture of phosphorous pentoxide. 18589. July 6.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

LONDON, JULY 13, 1922.

THE past week has been one of steady trade, and it is interesting to note that the collapse in the Continental exchanges has had comparatively little effect upon prices, although so far as export to the Continent is concerned it makes business even more difficult.

For home trade business has been satisfactory and in many lines an active turnover has been evident.

The general trend of prices is upward. Export trade has been much better and a fair volume of orders has gone through.

General Chemicals

ACETONE has been a particularly active market; stocks are scarce, and for prompt delivery considerable business has resulted.

ACID ACETIC has been in good demand, and the parcels arriving pass immediately into consumption.

ACID CITRIC is easier, due no doubt to the break in the weather. Manufacturers still look for higher prices.

ACID FORMIC is rather quiet, but the price is well maintained.

ACID LACTIC remains featureless.

ACID OXALIC is a slow market, with price unchanged.

ACID TARTARIC has not been quite so active; stocks, however, are very scarce, and a premium is paid for early delivery.

BARIUM CHLORIDE continues to advance, and the small stocks are in few hands.

CREAM OF TARTAR remains in good demand; the price tends upwards.

IRON SULPHATE is unchanged.

LEAD ACETATE is firmer, and the demand continues fair.

LEAD NITRATE is without special feature.

LITHOPONE is in fair demand, and is unchanged in value.

POTASSIUM CARBONATE remains weak, with little business passing.

POTASSIUM CAUSTIC remains a drug on the market.

POTASSIUM PRUSSIATE is still practically unobtainable for prompt delivery, and is higher in price.

SODIUM ACETATE.—A good turnover is evident, and the price tends higher.

SODIUM BICHROMATE is in better demand, and price is very firm.

SODIUM NITRATE is unchanged.

SODIUM PHOSPHATE remains slow of sale, but makers hold their price.

SODIUM PRUSSIATE is scarcer than ever. First hand supplies for this year are unobtainable.

WHITE LEAD is in good demand, and without change in value.

ZINC OXIDE is scarce, particularly for the better grades; the price seems likely to advance.

Coal Tar Intermediates

Trade has continued on quiet, easy lines during the past week, but export interest is maintained.

ALPHA NAPHTHOL.—A few small home orders have been received.

ALPHA NAPHTHYLAMINE is firm, with home inquiry about.

ANILINE OIL and SALT continue to pass into consumption, and the former is firm. Export inquiries also have been received for the salt.

BENZIDINE BASE and SULPHATE are quiet.

BETA NAPHTHOL has been slightly more interesting to home buyers.

BETA NAPHTHYLAMINE is without particular change.

DIMETHYLANILINE has been inquired for on home account.

DIPHENYLAMINE is very firm, with small stocks available.

"H" ACID is steady.

METAPHENYLENEDIAMINE has been in demand for British consumption.

NAPHTHIONATE OF SODA has been in demand.

NITROBENZOL is firm.

ORTHOAMIDOPHENOL has been booked on export account.

PARANITRANILINE has been inquired for on export account.

PARAPHENYLENEDIAMINE is in fair demand, and price has been increased.

RESORCIN is featureless.

Coal Tar Products

There is not quite so much activity in the market, but prices generally are firm, and in some cases show slight improvements.

90's BENZOL.—There is a fair demand, and business has been done at last week's prices, namely, 1s. 11d. to 2s. per gallon on rails at works.

PURE BENZOL is without change at 2s. 4d. per gallon.

CREOSOTE.—There is still some demand for export, and prices are somewhat better. To-day's values are 5d. to 5½d. per gallon in the North, and 5¾d. to 6¼d. in the South.

CRESYLIC ACID.—There is not quite so much activity, but prices are well maintained, and there is no change in the quotations.

SOLVENT NAPHTHA.—The market remains very dull, and buyers are scarce.

HEAVY NAPHTHA.—Very little business is passing, but there is no change in value, which remains at 1s. 9d. to 1s. 10d. per gallon.

NAPHTHALENE is still neglected, and very little business is being done.

PITCH.—There is still a good demand for prompt parcels, and full prices are being paid for such lots as are available. For forward delivery a few transactions have taken place, but pretentions of sellers limit business for the present. To-day's quotations are 75s. f.o.b. London, 72s. 6d. f.o.b. East Coast, and 76s. f.o.b. West Coast, both for prompt and forward delivery.

Sulphate of Ammonia

The price for the home trade is quoted only for July and August at £16 3s. for neutral quality, and £15 per ton for ordinary 25¼ per cent. This shows little change on the recent prices for the article. There is not much activity for export, chiefly owing to the fall in the value of the franc, and the price fixed in France is below the parity of English values for export.

Current Prices

Chemicals

	Per	£	s.	d.		£	s.	d.
Acetic anhydride	lb.	0	1	8	to	0	1	10
Acetone oil	ton	77	10	0	to	80	0	0
Acetone, pure	ton	73	0	0	to	74	0	0
Acid, Acetic, glacial, 99–100%	ton	67	0	0	to	68	0	0
Acetic, 80% pure	ton	43	0	0	to	44	0	0
Arsenic, liquid, 2000 s.g.	ton	67	0	0	to	70	0	0
Boric, cryst.	ton	60	0	0	to	65	0	0
Carbolic, cryst. 39–40%	lb.	0	0	6	to	0	0	6½
Citric	lb.	0	2	3½	to	0	2	4
Formic, 80%	ton	65	0	0	to	66	0	0
Gallic, pure	lb.	0	2	11	to	0	3	0
Hydrofluoric	lb.	0	0	7½	to	0	0	8½
Lactic, 50 vol.	ton	40	0	0	to	43	0	0
Lactic, 60 vol.	ton	43	0	0	to	45	0	0
Nitric, 80 Tw.	ton	30	0	0	to	31	0	0
Oxalic	lb.	0	0	8	to	0	0	8½
Phosphoric, 1.5	ton	38	0	0	to	40	0	0
Pyrogallic, cryst.	lb.	0	6	0	to	0	6	3
Salicylic, Technical	lb.	0	0	10½	to	0	1	0
Salicylic, B.P.	lb.	0	1	5	to	0	1	6
Sulphuric, 92–93%	ton	7	10	0	to	8	0	0
Tannic, commercial	lb.	0	2	3	to	0	2	9
Tartaric	lb.	0	1	6	to	0	1	6½
Alum, lump	ton	10	0	0	to	10	10	0

	Per	£	s.	d.		£	s.	d.
Alum, chrome	ton	28	0	0	to	29	0	0
Alumino ferric	ton	9	0	0	to	9	5	0
Aluminium, sulphate, 14–15%	ton	10	10	0	to	11	0	0
Aluminium, sulphate, 17–18%	ton	11	10	0	to	12	0	0
Ammonia, anhydrous	lb.	0	1	8	to	0	1	9
Ammonia, .880	ton	33	0	0	to	35	0	0
Ammonia, .920	ton	21	0	0	to	23	0	0
Ammonia, carbonate	lb.	0	0	4	to	0	0	4½
Ammonia, chloride	ton	60	0	0	to	65	0	0
Ammonia, muriate (galvanisers)	ton	35	0	0	to	37	10	0
Ammonia, nitrate (pure)	ton	35	0	0	to	40	0	0
Ammonia, phosphate	ton	74	0	0	to	75	0	0
Ammonia, sulphocyanide	lb.	0	1	10	to	0	2	0
Amyl acetate	ton	175	0	0	to	185	0	0
Arsenic, white, powdered	ton	42	0	0	to	44	0	0
Barium, carbonate, 92–94%	ton	12	10	0	to	13	0	0
Barium, Chlorate	ton	60	0	0	to	68	0	0
Barium Chloride	ton	22	0	0	to	22	10	0
Nitrate	ton	27	10	0	to	30	0	0
Sulphate, blanc fixe, dry	ton	20	10	0	to	21	0	0
Sulphate, blanc fixe, pulp	ton	10	5	0	to	10	10	0
Sulphocyanide, 95%	lb.	0	1	0	to	0	1	3
Bleaching powder, 35–37%	ton	12	0	0	to		—	
Borax crystals	ton	29	0	0	to	33	0	0
Calcium acetate, Brown	ton	9	0	0	to	9	10	0
" " Grey	ton	13	10	0	to	14	0	0
Calcium Carbide	ton	16	0	0	to	17	0	0
Chloride	ton	6	10	0	to	7	0	0
Carbon bisulphide	ton	50	0	0	to	52	0	0
Casein, technical	ton	47	0	0	to	55	0	0
Cerium oxalate	lb.	0	4	6	to	0	4	9
Chromium acetate	lb.	0	1	1	to	0	1	3
Cobalt acetate	lb.	0	6	0	to	0	6	6
Oxide, black	lb.	0	9	6	to	0	10	0
Copper chloride	lb.	0	1	2	to	0	1	3
Sulphate	ton	28	10	0	to	29	0	0
Cream Tartar, 98–100%	ton	115	0	0	to	117	10	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde, 40% vol.	ton	68	10	0	to	70	0	0
Formusol (Rongalite)	lb.	0	2	6	to	0	2	9
Glauber salts, commercial	ton	5	10	0	to	6	0	0
Glycerine, crude	ton	65	0	0	to	67	10	0
Hydrogen peroxide, 12 vols.	gal.	0	2	5	to	0	2	6
Iron perchloride	ton	30	0	0	to	32	0	0
Iron sulphate (Copperas)	ton	4	0	0	to	4	5	0
Lead acetate, white	ton	41	0	0	to	42	0	0
Carbonate (White Lead)	ton	42	0	0	to	46	0	0
Nitrate	ton	46	10	0	to	48	10	0
Litharge	ton	35	10	0	to	36	0	0
Lithopone, 30%	ton	23	10	0	to	24	0	0
Magnesium chloride	ton	10	0	0	to	10	10	0
Carbonate, light	cwt.	2	10	0	to	2	15	0
Sulphate (Epsom salts commercial)	ton	8	0	0	to	8	10	0
Sulphate (Druggists')	ton	13	10	0	to	14	10	0
Manganese, Borate, commercial	ton	65	0	0	to	75	0	0
Sulphate	ton	60	0	0	to	62	0	0
Methyl acetone	ton	60	0	0	to	65	0	0
Alcohol, 1% acetone	ton	65	10	0	to	66	0	0
Nickel sulphate, single salt	ton	49	0	0	to	51	0	0
Ammonium sulphate, double salt	ton	51	0	0	to	52	0	0
Potash, Caustic	ton	33	0	0	to	34	0	0
Potassium bichromate	lb.	0	0	6½	to		—	
Carbonate, 90%	ton	31	0	0	to	33	0	0
Chloride, 80%	ton	12	0	0	to	12	10	0
Chlorate	lb.	0	0	4½	to	0	0	5
Meta bisulphite, 50–52%	ton	84	0	0	to	90	0	0
Nitrate, refined	ton	45	0	0	to	47	0	0
Permanganate	lb.	0	0	9	to	0	0	10
Prussiate, red	lb.	0	4	6	to	0	4	9
Prussiate, yellow	lb.	0	1	6	to	0	1	8
Sulphate, 90%	ton	13	0	0	to	13	10	0
Salammoniac, firsts	cwt.	3	3	0	to		—	
Seconds	cwt.	3	0	0	to		—	
Sodium acetate	ton	24	10	0	to	24	15	0
Arseniate, 45%	ton	45	0	0	to	48	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bichromate	lb.	0	0	5½	to		—	
Bisulphite, 60–62%	ton	23	0	0	to	24	0	0
Chlorate	lb.	0	0	3½	to	0	0	4
Caustic, 70%	ton	20	10	0	to	21	0	0
Caustic, 76%	ton	21	10	0	to	22	10	0
Hydrosulphite, powder, 85%	lb.	0	1	9	to	0	2	0
Hyposulphite, commercial	ton	13	10	0	to	14	0	0

	Per	£	s.	d.		£	s.	d.
Sodium Nitrite, 96–98%	ton	31	0	0	to	32	0	0
Phosphate, crystal	ton	18	10	0	to	19	0	0
Perborate	lb.	0	0	11	to	0	1	0
Prussiate	lb.	0	0	11½	to	0	1	0
Sulphide, crystals	ton	13	0	0	to	14	0	0
Sulphide, solid, 60–62%	ton	21	10	0	to	23	10	0
Sulphite, cryst.	ton	12	10	0	to	13	0	0
Strontium carbonate	ton	55	0	0	to	60	0	0
Strontium Nitrate	ton	50	0	0	to	55	0	0
Strontium Sulphate, white	ton	6	10	0	to	7	10	0
Sulphur chloride	ton	25	0	0	to	27	10	0
Sulphur, Flowers	ton	13	0	0	to	14	0	0
Roll	ton	13	0	0	to	14	0	0
Tartar emetic	lb.	0	1	6	to	0	1	7
Tin perchloride, 33%	lb.	0	1	2	to	0	1	4
Perchloride, solid	lb.	0	1	5	to	0	1	7
Protochloride (tin crystals)	lb.	0	1	5	to	0	1	6
Zinc chloride 102° Tw.	ton	21	0	0	to	22	10	0
Chloride, solid, 96–98%	ton	25	0	0	to	30	0	0
Oxide, 99%	ton	36	0	0	to	38	0	0
Dust, 90%	ton	45	0	0	to	47	10	0
Sulphate	ton	18	10	0	to	19	10	0

Coal Tar Intermediates, &c.

	Per	£	s.	d.		£	s.	d.
Alphanaphthol, crude	lb.	0	2	3	to	0	2	6
Alphanaphthol, refined	lb.	0	3	0	to	0	3	3
Alphanaphthylamine	lb.	0	2	0	to	0	2	1
Aniline oil, drums extra	lb.	0	1	0	to	0	1	1
Aniline salts	lb.	0	1	1	to	0	1	2
Anthracene, 40–50%	unit	0	0	8½	to	0	0	9
Benzaldehyde (free of chlorine)	lb.	0	3	9	to	0	4	3
Benzidine, base	lb.	0	5	9	to	0	6	0
Benzidine, sulphate	lb.	0	5	9	to	0	6	0
Benzoic acid	lb.	0	1	7½	to	0	1	9
Benzoate of soda	lb.	0	1	6	to	0	1	7
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol benzoate	lb.	0	4	9	to	0	5	0
Betanaphthol	lb.	0	1	4	to	0	1	4½
Betanaphthylamine, technical	lb.	0	6	0	to	0	7	0
Croceine Acid, 100% basis	lb.	0	3	6	to	0	3	9
Dichlorbenzol	lb.	0	0	9	to	0	0	10
Diethylaniline	lb.	0	2	9	to	0	3	0
Dinitrobenzol	lb.	0	1	3	to	0	1	4
Dinitrochlorbenzol	lb.	0	0	11	to	0	1	0
Dinitronaphthalene	lb.	0	1	4	to	0	1	5
Dinitrotoluol	lb.	0	1	5	to	0	1	6
Dinitrophenol	lb.	0	2	9	to	0	3	0
Dimethylaniline	lb.	0	2	3	to	0	2	6
Diphenylamine	lb.	0	4	3	to	0	4	6
H-Acid	lb.	0	6	6	to	0	7	0
Metaphenylenediamine	lb.	0	5	6	to	0	5	9
Monochlorbenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	6	0	to	0	6	6½
Monosulphonic Acid (2.7)	lb.	0	5	6	to	0	6	0
Naphthionic acid, crude	lb.	0	3	0	to	0	3	3
Naphthionate of Soda	lb.	0	3	0	to	0	3	3
Naphthylamin-di-sulphonic-acid	lb.	0	4	0	to	0	4	3
Neville Winther Acid	lb.	0	7	9	to	0	8	0
Nitronaphthalene	lb.	0	1	4	to	0	1	5
Nitrotoluol	lb.	0	1	0	to	0	1	2
Orthoamidophenol, base	lb.	0	10	0	to	0	10	5
Orthodichlorbenzol	lb.	0	1	0	to	0	1	1
Orthotoluidine	lb.	0	1	6	to	0	1	9
Orthonitrotoluol	lb.	0	0	10	to	0	1	0
Para-amidophenol, base	lb.	0	10	0	to	0	10	6
Para-amidophenol, hydrochlor	lb.	0	10	6	to	0	11	0
Paradichlorbenzol	lb.	0	0	6	to	0	0	7
Paranitraniline	lb.	0	3	6	to	0	3	9
Paranitrophenol	lb.	0	2	3	to	0	2	6
Paranitrotoluol	lb.	0	5	0	to	0	5	3
Paraphenylenediamine, distilled	lb.	0	10	6	to	0	10	9
Paratoluidine	lb.	0	7	0	to	0	7	6
Phthalic anhydride	lb.	0	2	9	to	0	3	0
Resorcin, technical	lb.	0	5	6	to	0	6	0
Resorcin, pure	lb.	0	7	0	to	0	7	3
Salol	lb.	0	2	0	to	0	2	3
Sulphanilic acid, crude	lb.	0	1	0	to	0	1	1
Tolidine, base	lb.	0	6	6	to	0	7	0
Tolidine, mixture	lb.	0	2	6	to	0	2	9

Contracts Open

Tenders are invited for the following articles. The latest dates for receiving tenders are, when available, given in parentheses :

SHEFFIELD (July 28).—Aerial ropeway. Particulars from and tenders to S. E. Fedden, Commercial Street, Sheffield.

LEEDS (July 18).—Oils, paints, etc. Particulars from and tenders to J. H. Ford, Poor Law Offices, South Parade, Leeds.

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to* THE CHEMICAL AGE *by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.

GLASGOW, JULY 12, 1922.

BUSINESS during the past week has been fairly satisfactory, prices on the whole being well maintained. Numerous inquiries, both home and export, continue to be received.

Owing to the heavy fall in value of the German mark, Continental offers are inclined to be lower.

Industrial Chemicals

ACID ACETIC.—Glacial 98/100 per cent. quoted £65 to £67 per ton; 80 per cent. technical on offer at £38 per ton, spot delivery.

ACID BORACIC.—No change in price. Crystal or granulated, £60 per ton; powdered, £62 per ton.

ACID FORMIC, 80%.—Moderate inquiry. Price £66 to £67 per ton.

ACID HYDROCHLORIC.—Still in little demand. Price, 6s. 6d. per carboy, ex works.

ACID OXALIC.—Cheap Continental offers at about 7d. per lb. c.i.f., duty paid.

ACID SULPHURIC.—Makers' prices unchanged; 144°, £4 per ton; 168°, £7 5s. per ton; de-arsenicated quality £1 per ton more.

ALUM, LUMP POTASH.—In moderate demand. Price, £15 to £15 5s. per ton, ex store.

ALUMINA SULPHATE.—Continental make on offer for forward delivery at £9 per ton, c.i.f. for 17/18 per cent.

AMMONIA, ANHYDROUS.—Makers quote 1s. 10d. per lb. ex works.

AMMONIA CARBONATE.—A few inquiries for export. Quoted 4d. to 4¼d. per lb.

AMMONIA LIQUID, 880°.—Little inquiry. Price about 3½d. to 3¾d. per lb.

AMMONIA MURIATE.—Galvanisers grey quality, £35 per ton; fine white, £33 per ton.

AMMONIA SALAMMONIAC, CRYSTALS.—Quoted £56 to £57 per ton.

AMMONIA SULPHATE.—25¼ per cent., £14 10s. per ton; 25¾ per cent. neutral, £15 3s. per ton, ex works, prompt.

ARSENIC (WHITE POWDERED).—Moderate inquiry. Price, £44 per ton ex quay.

BARIUM CHLORIDE.—Continental offers of 98/100 per cent. white crystals at £19 10s. per ton, c.i.f. U.K.

BARYTES.—Fine white quality, £5 5s. per ton ex works, prompt delivery.

BLEACHING POWDER.—English make, £13 per ton ex station. Cheap Continental offers of £10 15s. per ton c.i.f. U.K.

BORAX.—Price unchanged. Crystals or granulated, £29 per ton; powdered, £30 per ton.

CALCIUM CHLORIDE.—English make £6 10s. per ton, ex station. Continental offers of £5 10s. per ton c.i.f. U.K.

COPPERAS GREEN.—In little demand. £3 15s. to £4 per ton, ex works.

FORMALDEHYDE, 40%.—Quoted £69 to £70 per ton. Cheap offers of Canadian manufacture at £59 per ton c.i.f. U.K.

GLAUBER SALTS.—Fine white crystals, £5 per ton ex store. In little demand.

LEAD ACETATE.—Continental offers of £37 per ton for white crystals; brown, £33 per ton c.i.f. U.K.

LEAD, RED.—£37 10s. per ton; moderate demand.

LEAD, WHITE.—£50 10s. per ton.

MAGNESITE (Ground Calcined).—Practically no demand; £10 to £12 10s. per ton ex store, according to quality.

MAGNESIUM CHLORIDE.—Price about £7 5s. to £7 10s. per ton ex store.

MAGNESIUM SULPHATE (Epsom Salts).—No change in price. Commercial, £7 10s. per ton; B.P. quality, £9 15s. per ton.

NAPHTHALENE.—Crystals quoted £15 10s. per ton f.o.b.; flakes, £16 10s.

POTASSIUM BICHROMATE.—Makers' price unchanged at 6¾d. per lb. delivered.

POTASSIUM CARBONATE, 88/92%.—In little demand. About £29 to £30 per ton.

POTASSIUM CAUSTIC, 88/92%.—Quoted £30 per ton c.i.f. U.K.; prompt shipment. Spot lots, £33 to £34 per ton.

POTASSIUM NITRATE (SALTPETRE).—Moderate inquiry. About £34 to £35 per ton.

POTASSIUM PRUSSIATE.—Fair inquiry. Quoted 1s. 6d. to 1s. 7d. per lb. ex station.

PYRITES.—North African, 48%, offered at 25s. 6d. per ton, c.i.f. U.K. port.

SODIUM BICARBONATE.—Refined quality, £11 per ton, ex quay or station, mineral-water quality, £10 per ton.

SODIUM BICHROMATE.—Makers' price unchanged, 5¼d. per lb. delivered.

SODIUM CARBONATE.—(Alkali 58%), £9 2s. 6d. per ton, ex quay or station; (Soda Crystals) £6 per ton, ex quay or station.

SODIUM CAUSTIC.—76/77%, £23 10s.; 70/72%, £21 10s.; 60%, £24 5s.; 98/99% powdered, £27 to £28 per ton, ex station. Fair inquiry for export.

SODIUM HYPOSULPHITE.—Commercial crystals, £13 10s. to £14 10s. per ton, ex station; pea crystals, £20 per ton, ex station.

SODIUM NITRATE.—Moderate inquiry. £14 per ton; refined quality, £14 5s. per ton.

SODIUM PRUSSIATE (YELLOW).—Quoted 11½d. per lb. delivered.

SODIUM SULPHATE (SALTCAKE 95%).—Price remains £4 per ton. Quantities for export at same figure.

SODIUM SULPHIDE.—60/62% conc. quality offered at £16 10s. per ton, c.i.f. for prompt shipment from Continent.

SULPHUR.—Government stocks of Sicilian thirds available at £4 5s. to £4 15s. per ton; flowers, £15; roll, £14; rock, £13; ground, £13 per ton.

ZINC DUST, 92%.—Small home inquiry. Offered at £35 per ton free on rails.

ZINC SULPHATE.—Offered for forward delivery at £10 per ton, c.i.f. U.K.

NOTE.—The above prices are for bulk business, and are not to be taken as applicable to small parcels.

Coal Tar Intermediates and Wood Distillation Products

BENZOL.—Crude material, 65 per cent. at 120° C., is now being offered at 1s. 2¼d. per gallon.

DIMETHYLANILINE.—Some inquiries. Price remains firm at 2s. 6d. per lb. delivered, in returnable drums.

DIPHENYLAMINE.—Home inquiry. Price 4s. 3d. per lb., delivered.

"G" SALT.—Home inquiry. Price quoted, 3s. 6¾d. per lb., on 100 per cent. basis, carriage paid.

"H" ACID.—Home inquiries. Price quoted, 6s. 7½d. per lb., 100 per cent. basis, delivered.

METHYL ALCOHOL, 99/100 per cent.—Now offered at 75s. per cwt., c.i.f.

MONOSULPHONIC ACID.—Home inquiry. Price quoted, 10s. 9d. per lb., 100 per cent. basis, carriage paid.

PARADICHLORBENZOL.—Export inquiry. Price quoted £40 per ton, f.o.b.

PARANITRANILINE.—Now offered at 3s. 2d. per lb. in ton lots and 3s. 3d. per lb. in smaller lots, delivered.

The Nitrate Market

IN their latest report on the nitrate of soda market, Aikman (London), Ltd., state that a steady demand has continued during the past fortnight both for spot and next spring delivery, and "pool" sales have amounted to about 60,000 tons. Their unsold stocks at June 30 thus amounted to 180,000 to 190,000 tons. Quotations are about £13 to £13 10s. per ton for spot, £11 5s. September, and £12 to £12 10s. per ton for next spring delivery. European deliveries during June reached 60,000 tons, against 36,500 tons last year, and indications point to satisfactory deliveries in July also. The Producers' Association have made large sales during the fortnight, amounting to about 100,000 tons, mostly for July delivery, and they have now withdrawn from selling before August delivery. The total quantity sold since the new prices were fixed now amounts to 290,000 tons.

War-time Manufacture of T.N.T.

Chemists' Claim Regarding Improved Process

On Monday, before the Royal Commission on Awards to Inventors, Mr. Justice Sargant presiding, Lieut.-Colonel Craig, Sir Robert Robertson, Dr. R. C. Farmer, and Dr. G. Rotter claimed for services rendered in the preparation and designing of apparatus and machinery for the production of T.N.T.

Mr. Hunter Gray, for the claimants, said the Crown would contend that the claimants were in the service of the Crown at the time of the invention, and that the invention came within the scope of their official duties. He would deny these contentions, and even if it were true that it was part of their official duties, the services rendered were of such exceptional merit and value to the country as to justify a special award. The claimants were asked to lay down plant capable of producing three tons of T.N.T. per week by an old process. Instead of laying down the old plant, they worked out the whole thing *de novo*, and by devising an incomparably better process they produced 1,000 tons a week, and in their estimation saved the country £2,500,000. By this process 107,000 tons of T.N.T. were produced.

Sir Robert Robertson, Government Chemist, gave evidence of the early experiments carried out by the claimants under intensive conditions for about two months. From that work emanated their process, and in speaking of the experimental work he recalled how, one Sunday morning, he went to the Arsenal scrap heap and collected material to serve in the experimental plant. In 1918, when they made a claim upon the Government for the invention, Major-General Seely admitted the merits of the invention, but said that he was not in a position to recommend an award. He thought, however, recompense might be made in other ways.

Answering the Attorney-General (Sir Ernest Pollock), who appeared for the Crown, Sir Robert Robertson said that by the year 1919 his (witness's) pre-war salary had been doubled, in addition to which he had received the bonuses for increased prices. He was made a Knight Commander of the Order of the British Empire in 1918, but he had no information what it was for. He thought it was for general work as head of a section, and not for specific things. So far as increase of salary was concerned, the Department had been brought into line with like establishments.

The Commission adjourned.

Glasgow Company's Partnership Claim

In the Scottish Court of Session on June 29, Lord Blackburn disposed of an action brought by Merry and Cunninghame, Ltd., 127, St. Vincent Street, Glasgow, against the Carnbroe Chemical Co., Ltd., 14, St. Vincent Place, Glasgow, for declarator that an agreement entered into between the pursuers and the defenders in July, 1891, had ceased to be binding upon the parties, and that the defenders were not entitled to deduct from the half-share of the profits of the defenders' business falling to the pursuers for any one year any sum required to make up in any other year the amount of the preferential payment of 7½ per cent. on the defenders' capital expenditure. The Judge assoilzied the defenders from the first conclusion, and granted decree in terms of the second conclusion, and found no expenses due to or at by either party. Under the agreement the chemical company obtained certain rights in the gases of the pursuers' close-topped iron furnaces at Carnbroe Iron Works.

Lever Brothers' Co-partnership Scheme

In the House of Lords, on June 30, before Lords Buckmaster, Atkinson, Sumner, Wrenbury, and Carson, the hearing of the question whether trade unions can expel members on the ground that their participation in the co-partnership of Lever Brothers, Ltd., justifies their expulsion, was commenced. The matter arose on the appeals of the Amalgamated Society of Carpenters, Cabinet-makers, and Joiners and of the General Union of Operative Carpenters and Joiners from orders of the Court of Appeal reversing judgments of Mr. Justice Eve. The hearing was adjourned.

Institution of Chemical Engineers

A meeting of the Provisional Committee of the Institution was held on Wednesday, June 28. After the usual introductory business a letter from Mr. K. B. Quinan was read, expressing his willingness to support to the best of his ability the interests of the organisation, and that, although distance made it difficult for him to do what he would wish, he was willing to take any part that the provisional committee desired, and which was in his power, in developing the Institution.

A letter was read from the Secretary of the American Institute of Chemical Engineers stating that they had pleasure in presenting the Institution with a full set of their *Transactions*, and offering every support in their power to the new Institution.

The Secretary reported that the Board of Trade had referred to the solicitor certain points raised by the Institute of Chemistry in the proposed Constitution of the Institution. The Institute suggested that misunderstanding would be avoided if the term "Chemical Engineer" were defined. After a considerable amount of discussion the following definition was agreed upon :—

> "The chemical engineer is a professional man experienced in the design, construction, and operation of plant in which materials undergo chemical or physical change."

The further suggestion that the word "Institution" should be changed to that of "Association," was also discussed, and it was hoped that the Institute of Chemistry would withdraw their suggestion, since the word "Institution" was definitely understood, and placed the new body in its proper category.

A statement of accounts was submitted by the honorary treasurer showing a credit balance of £219 5s. 5d.

The Report was received and adopted.

The selection committee submitted the first application form for membership. After discussion and a few slight amendments the form was approved, and the honorary secretary was requested to insert a notice in the technical press intimating that application forms for membership could be obtained from the secretary of the Institution, 166, Piccadilly, London, W.1.

Low Temperature Works at Barnsley

In a report issued to shareholders the directors of Low Temperature Carbonisation, Ltd., state that, after nearly a year's trial, the 20 retorts at Barnsley continue to turn out from coal slack the smokeless fuel "Coalite" and the resultant oils—"Coaline"—even more efficiently than when the last report was made. The "Coalite" produced has been readily sold to some 2,200 customers at prices in excess of those obtained for the best domestic coal.

The commercial value of this fuel, the report continues, has now been established by the fact that one of the leading coal distributors of the country has just signed a contract with the company to purchase at prices equal to those prevailing for best domestic coal the whole of the output of "Coalite" up to 250,000 tons per annum for the next five years. The crude oil obtained, on investigation by chemists, is stated to be proving very valuable, and the entire output of this oil has been sold at 1s. per gallon. The buyers have offered to take at this price at least 200,000 gallons, with options on much larger quantities. In distillations undertaken on behalf of the company the crude oil obtained from one ton of coal slack has yielded 10 gallons of motor spirit.

The patents covering this process are protected throughout the world. New and important patents have been taken out during the past twelve months, greatly strengthening the company's position.

Calcutta School of Chemical Technology

We have received from Mr. J. C. Ghosh, principal and hon. secretary of the School of Chemical Technology, Calcutta, a report on recent work at the school, in which it is stated that vacation classes—a hitherto unknown educational feature in India—are being held at the school during the summer vacation. During May appreciable progress was made on the manufacturing side, the supply, at special rates, of rectified spirit having recently been authorised by the Excise Department, Bengal.

Company News

NOBEL INDUSTRIES, LTD.—The transfer books for the preference shares will be closed from July 17 to 31 inclusive.

BROKEN HILL PROPRIETARY CO., LTD.—The ordinary general meeting of the company will be held in Melbourne on August 25.

DOMINION TAR AND CHEMICAL CO.—An interim dividend of 2½ per cent., free of tax, for the half-year ended June 30, is payable to-day (Saturday).

JOHN KNIGHT, LTD.—The directors announce a dividend on the 25 per cent. cumulative preferred ordinary shares at the rate of 12½ per cent. for the half-year to May 31.

CANADIAN EXPLOSIVES CO.—A dividend of 1¾ per cent. for the quarter ended June 30 on the 7 per cent. cumulative preferred shares is payable on July 15, to shareholders of record June 30, 1922.

LEVER BROTHERS, LTD.—It is reported in regard to the Lever Brothers' preference share syndicate that the whole of the shares pooled have now been sold. Cheques for the profit will be distributed as soon as the accounts have been made up.

MAZAPIL COPPER CO.—The directors have issued a circular to shareholders stating that negotiations for the acquisition of the concern are in progress, and advising them not to part with their shares at a sacrifice. On the Manchester Stock Exchange on Wednesday the shares advanced from 27s. 6d. to 30s.

BRITISH CELLULOSE AND CHEMICAL MANUFACTURING CO., LTD.—The Order of the High Court of Justice, Chancery Division, dated June 20, confirming the reduction of the capital of the company from £7,750,000 to £6,000,000, and the minute (approved by the Court), showing with respect to the share capital of the company as altered the particulars required by the Companies (Consolidation) Act, 1908, were registered by the Registrar of Companies on July 1.

ELECTROLYTIC ZINC CO. OF AUSTRALIA, LTD.—Holders of the cumulative participating preference shares will receive, on September 1, a dividend at the rate of 8 per cent. per annum for the half-year ended June 30. It is intended to make subsequent distributions at half-yearly intervals, and the directors will shortly take into consideration the payment of the whole or part of the interest which has accumulated on the preference shares up to December 31, 1921, which at that date amounted to 1·1326s. per share.

LECKHAMPTON QUARRIES CO., LTD.—The company have been inviting offers for 86,900 eight per cent. participating preference and 36,150 ordinary shares at par. The limestone quarried is said to be of exceptional purity and an analysis by Mr. G. Embrey, F.I.C., public analyst for Gloucester, is given in the prospectus. The company, which has an authorised capital of £250,000, of which £76,950 is issued, has arranged to borrow £50,000 under the Trade Facilities Act, 1921; this loan is repayable in 25 years.

BRITISH COTTON-SEED PRODUCTS.—The accounts to March 31 last show a loss for the period of £4,179. Sundry causes supervened in the summer and autumn of last year which delayed completion of the first instalment of machines and commencement of active trading operations until January, 1922. The defibrating machines have proved themselves capable of working continuously and satisfactorily, and the plant, generally, has worked well. Experience gained under working conditions indicates the desirability, in the interests of efficiency and economy, of the installation of further special accessory plant for dealing with certain varieties of seed shipped to this country apart from the process of defibration. The erection of the second instalment of defibrating machines, which had been postponed pending determination of character and disposition of this additional accessory plant, is now in hand. The cash resources of the company are ample for erection of further machines and accessory plant, and for general purposes. The annual meeting will be held at Winchester House, London, on July 18, at 12.30.

Hygroscopicity of Tetryl and Tetranitroaniline

AT the Pittsburgh, Pa., experiment station of the Bureau of Mines, a study is being made of the hygroscopicity of tetryl and tetranitroaniline. The purpose of the investigation is to determine the physical constants of pure chemicals and the commercial products as used in the manufacture of explosives.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

LOCALITY OF FIRM OR AGENT.	MATERIAL.	REF. NO.
Canada ..	Perfumery and allied goods	769/62/F.G./C.C.
Amsterdam	Heavy Chemicals, Pharmaceutical Products and Castor Oil.. ..	35
Amsterdam	Artificial Manures ..	36
Buenos Aires	Druggists' Sundries ..	53

Tariff Changes

FRANCE.—Modifications of the co-efficients on various oils, mineral wax, sulphate of alumina were published in the Board of Trade *Journal* of July 6 (p. 21).

ST. CHRISTOPHER AND NEVIS.—The general tariff rate for explosives is now increased to 25 per cent., while the British preferential tariff remains at 15 per cent.

BELGIUM.—As from June 30 colouring materials with an aniline base may only be imported into Belgium under licence. It is further provided that these goods need no longer be accompanied by the certificate of origin required by the Royal Decree of August 9, 1919.

ITALY.—The abolition of the import prohibitions on United Kingdom goods extends also to goods of Australian and Canadian origin, even if shipped direct to Italy. Goods originating in any part of the British Empire and imported into Italy *via* the United Kingdom were already free from restriction. These concessions do not apply to dyes and dyestuffs or to goods the importation of which is reserved to the State.

UNITED KINGDOM.—A notice in the Board of Trade *Journal* of July 6 (p. 24) gives a list of export prohibited goods as from July 1. This list includes cocaine and salts thereof, diamorphine, ecgonine, morphine, opium. Applications for licences to export the above-mentioned drugs should be addressed to the Under-Secretary of State, Home Office, Whitehall, London. Licences to export prohibited goods are obtainable from the Imports and Exports Licensing Section, Board of Trade, Great George Street, London. Sulphate of ammonia; basic slag; compound manures containing either sulphate of ammonia, superphosphate of lime, or basic slag; and superphosphate of lime are included in the list, but open general licences have been issued permitting the export to all destinations of sulphate of ammonia and compound manures having sulphate of ammonia as their only export prohibited constituent; and the export to the Channel Islands of basic slag; superphosphate of lime; and compound manures containing either basic slag or superphosphate of lime.

Chemical Worker's Compensation Claim

JUDGE GRAHAM, K.C., has given a written considered judgment in the case heard in the Bow County Court, on Tuesday, in which Geo. Gibbard, a counter hand, of 7, Folkestone Road, West Ham, sought to obtain compensation under the Workmen's Compensation Act against Thos. Tyrer and Co., Ltd., chemical manufacturers, Stirling Works, Canning Road, Abbey Mills, Stratford, for an alleged accident which occurred at the works, through which he had lost the sight of one eye. The defence was that the accident did not arise out of or in the course of his employment.

In his considered judgment Judge Graham decided that it was an accident within the scope of his work. He was therefore entitled to 35s. weekly total incapacity for the period he was attending the hospitals, and £1 weekly from now for partial incapacity; in all £44 os. 10d. to date. The £1 a week will continue. Judgment was entered accordingly, with costs.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible or any errors that may occur.

County Court Judgments

[NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.]

BLUNT (W. H.) AND SON, 79½, Snowhill, Birmingham, chemists. £27 9s. May 11.

KEMP AND CO., LTD., 220, Holloway Road, N., chemists. £15 14s. 7d. May 12.

LEIGHTON LABORATORIES, LTD., 9/10, Pancras Lane, Queen Street, E.C., manufacturing chemists. £23 os. 7d. May 10.

MASON, D., 4, Victoria Terrace, Dudley, chemical manufacturer. £12 11s. 7d. May 8.

NEVILLES (PARIS), LTD., 16, Woodstock Street, W., toilet goods manufacturers. £10 11s. 4d. April 25.

NEWMAN, A. P., 51, Thompson Street, Barry Dock, chemist. £13 9s. 8d. May 10.

NOBLE, W. D., Noble's Drug Stores, 2, Well Street, Cable Street, E., chemist. £44 8s. 10d. May 18.

Mortgages and Charges

*[NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.]*

GRAYSON (CHEMISTS) LTD., London, W.—Registered June 28, £6,000 debentures; charged on 221, High Street, South Kensington, also general charge.

HARKER (C. R.), STAGG AND MORGAN, LTD., London, E. manufacturing chemists.—Registered July 1, mortgage to bank; charged on certain properties at Canal Road, E., etc., also general charge. *£5,350. December 27, 1921.

STEEL (J. M.) AND CO., LTD., London, E.C., chemical manufacturers.—Registered, June 29, £600 debentures balance of £1,000; general charge.

TAYLORS' DRUG CO., LTD., Leeds.—Registered, June 29, £4,000 mortgage; charged on 7, Darwen Street, Blackburn. *£66,168 16s. 2d. November 28, 1921.

WILSON (H. E.), LTD., Liverpool, paint manufacturers.—Registered June 27, further charge to bank; charged on 25, Dublin Street, Liverpool, and land, workshop, and other buildings in Carlton Street, Liverpool; also registered June 27, £1,500 debentures; general charge. *£5,016. March 6, 1922.

Satisfactions

BOOTH AND OPENSHAW, LTD., Blackburn, chemists, etc.—Satisfaction registered June 29, £3,500, registered September 7, 1915.

LIVER GREASE, OIL AND CHEMICAL CO., LTD., Liverpool.—Satisfaction registered June 29, £4,000, part of amount registered May 20, 1921.

NORTH EASTERN CHEMICAL CO., LTD., London, E.C.—Satisfaction registered June 28, £10,000 registered November 5, 1921.

ROWE (T. B.) AND CO., LTD., Brentford, soap manufacturers.—Satisfactions registered July 1, £1,500, part of amount registered February 20, 1906; and £1,000, part of amount registered February 8, 1913.

London Gazette

Company Winding Up

INECTO, LTD.—Registered office, 15A, North Audley Street, London. Winding up Order, July 4.

Companies Winding up Voluntarily

MARCOTTY (P.) AND CO., LTD.—A. J. Utton, 13, Poplar Avenue, Mitcham, Surrey, appointed liquidator.

CAVE, J. R., LTD.—J. A. Bond, Hoghton Chambers, Southport, appointed liquidator. Meeting of creditors, Monday, July 17, at 12 noon, at the offices of the liquidator. Particulars of claims to liquidator by August 31.

Bankruptcy Information

JAMES, Evan William, 56 and 58, Oxford Street, Mountain Ash, and 33, Rheola Street, Penrhiwceibr, Glamorgan, dispensing chemist and druggist. Receiving order, July 3. Debtor's petition.

PRESCOTT, Alfred, as PRESCOTT AND CO., Rutland Mills, Oswald Street, Hulme, Manchester, Drake Street, Manchester, Holt Town, Manchester, and Mill Bank Chemical Works, Triangle, Halifax, chemical and aniline dye manufacturer. First meeting, July 17, 2.30 p.m. Official Receiver's Offices, Byrom Street, Manchester. Public examination, August 25, 10 a.m., Court House, Quay Street, Manchester.

Notice of Dividend

VINE, Joseph, 222 and 224, Harrow Road, London (trading as the TOILET SUPPLY COMPANY) manufacturers of toilet preparations. Amount per £, 2s. 4½d. First and final. Payable, July 14, 24/27, Rood Lane, E.C.3.

New Companies Registered

KELHEAD LIME AND COAL CO., LTD., 114, High Street, Lockerbie. Lime quarry masters, chemical manufacturers, etc. Nominal capital, £6,000 in £1 shares.

BURNHEAD LIME CO., LTD., The Burnhead Lime Works, Kirtlebridge, Dumfriesshire. Lime burners, mine owners, etc. Nominal capital, £3,000 in £1 shares.

LAWRY, HAWKE AND CO., LTD. Manufacturers of fertilisers and artificial manures, etc. Nominal capital, £10,000 in £1 shares. A subscriber: J. W. Lawry, "Tharsis," Calstock, Cornwall.

CHEMICAL AND TECHNICAL ENGINEERING CO., LTD. Manufacturers of and dealers in chemical compounds, products and preparations, engineers, agents, etc. Nominal capital, £12,000 in 10,000 participating preference shares of £1 each and 40,000 ordinary shares of 1s. each. A director: G. W. McArthur, 37, Walbrook, London, E.C.

FERENS AND LOVE, LTD., 28, Market Place, Durham. Manufacturers of patent and special fuel, chemicals, dyes, etc. Nominal capital, £30,000 in £10 shares.

PHILDES PRODUCTS CO., LTD., 19, Devereux Court, Strand, London. Manufacturers of chemical, toilet, and perfumery preparations, etc. Nominal capital, £1,000 in £1 shares (500 preference and 500 ordinary).

EDWARD JACKSON'S LABORATORIES, LTD., 14, Bedford Row, London. To acquire interests in chemical compounds for the treatment of inner tubes of pneumatic tyres. Nominal capital, £100 in £1 shares.

WELLINGTON AND WARD, LTD., Shenley Road, Elstree, Herts. Manufacturers of photographic chemicals. Nominal capital, £200,000 in 50,000, 10 per cent. cumulative preference, and 150,000 ordinary shares of £1 each.

PRIPP DE BRUN AND CO., LTD. Manufacturers and importers of and dealers in perfumes, toilet requisites, etc. Nominal capital, £1,000 in £1 shares. A director: C. Carling, 17, Courtfield Road, South Kensington, London.

H. DALTON, LTD., Greenside Mills, Skelmanthorpe. Manufacturers of and dealers in carbide of calcium and other mineral and chemical products or substances. Nominal capital, £100 in £1 shares.

ILLINGWORTH CARBONIZATION CO., LTD., 16, Kennedy Street, Manchester. To acquire certain existing inventions relating to the carbonisation of coal, etc. Nominal capital, £21,400 in £1 shares (20,000 "A" ordinary and 1,400 "B" ordinary).